ARCHIVES OF

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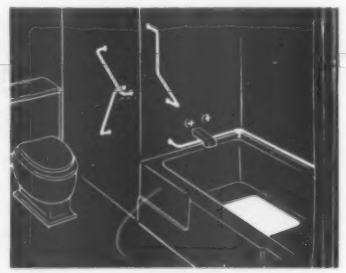

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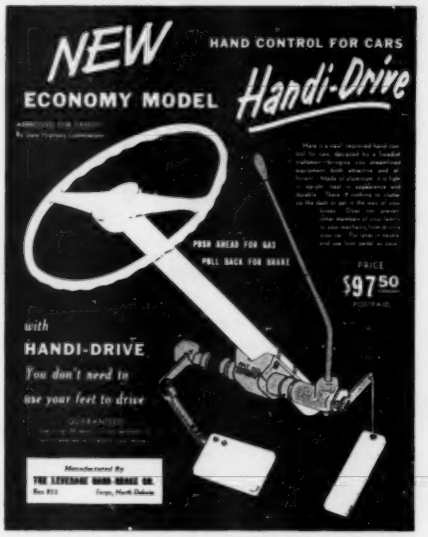

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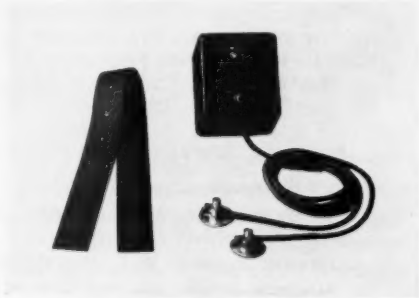

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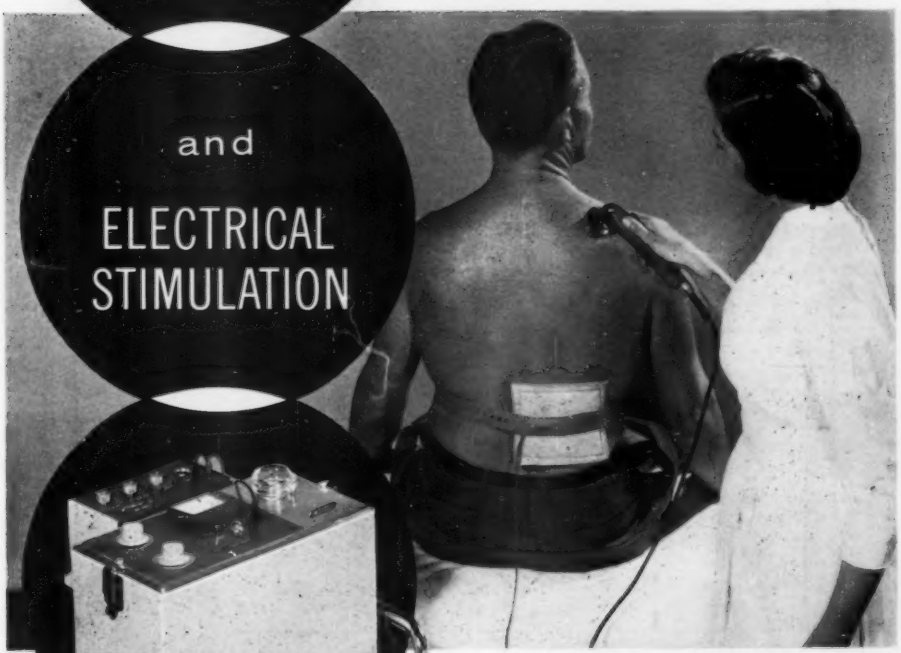

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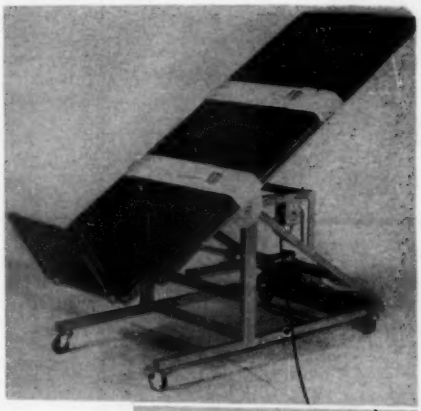

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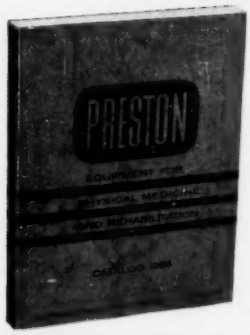

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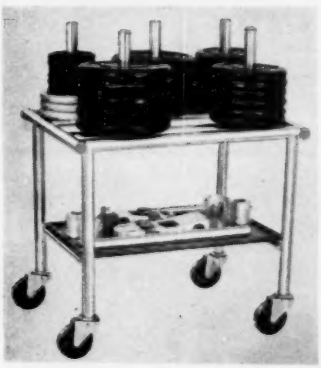

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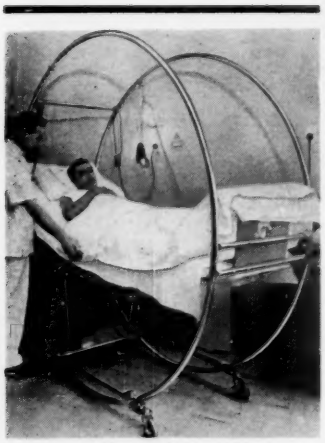

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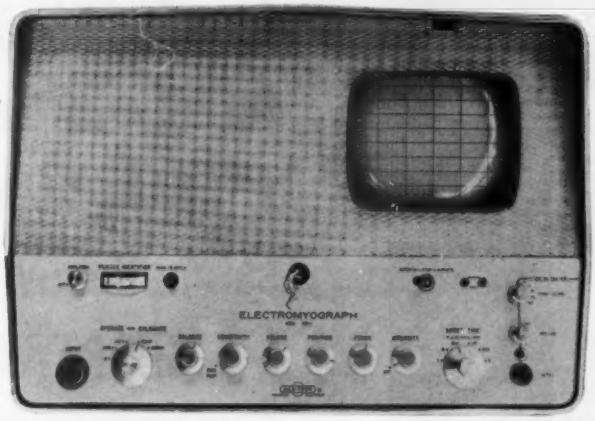

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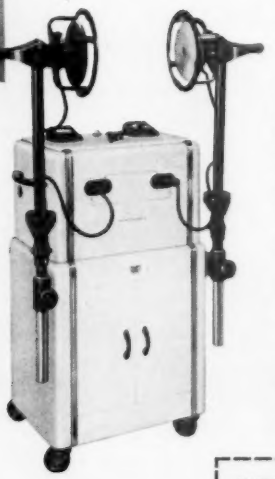

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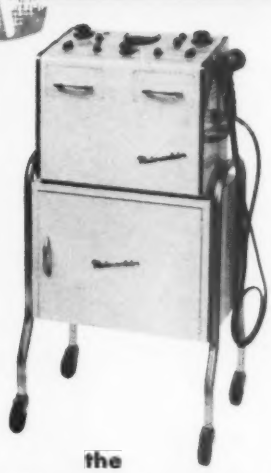

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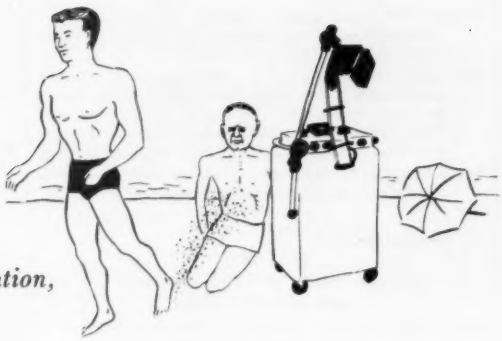

(Then I founded The Birtcher Corporation, and lost 4 more pounds.)

As I sit writing this, we've just finished a little dinner at a restaurant around the corner from the plant. It was quite a meal . . . and the occasion was a "get-together" with those people here at the factory that helped me get this outfit going in 1936, just 25 years ago.

Al Babeaux was across from me. He's a pretty unsung guy in the industry, being in the Production and Engineering end. I sure remember a lot of nights over the years when Al's light was burning long after everybody else had gone home . . . as he sat and tried to figure what was wrong with a drawing, or how a design could be improved, or how we could possibly manufacture enough units to fill a big order I might have sent in from the east. He's the senior vice-president now, but somehow I will always remember him as a big gangling kid engineer who wanted to make our units the best in the world.

Next to Al, and eating a big steak, was Sacha Bollas. Sacha is our Export Division chief, and a good one. Back in '36, though, we didn't know if we could sell outside of California . . . and when Sacha came in with an idea for exporting the units, we had to think about it quite a while. He's really done a job for us — we're currently shipping to 88 foreign countries this month—but I still couldn't help but think how scared we were back then when he mentioned "Europe."

On either side of me at the table were Ed Townsend and Bill Cobleigh. Bill was the machinist back in '36, and Eddy was our assembler. They're celebrating a quarter century with us, too. Bill's a research-and-development engineer now, and Eddy's a senior machinist.

It wasn't a very big dinner . . . there were only five of us. But that's all there were back in '36, too. The only people missing were a lot of M.D.'s and Physical Therapists out there that have been with us all these years, too. I wish you could have all been here . . . you've been as much a part of our growth as any one of us.

It's been a long road, but a good one. I hope you'll forgive me for being such a sentimental idiot today . . . it's just that a Silver Anniversary doesn't come around very often.

Cordially,

Cecil Birtcher

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Clinical Evaluation of a New Approach in the Treatment of Contracture Associated With Hip Fracture after Internal Fixation

Justus F. Lehmann, M.D.
Wilbert E. Fordyce, Ph.D.
Lois A. Rathbun, B.S.
Ruth E. Larson, B.S.
and
Dorothy H. Wood, B.S.
Seattle, Wash.

● Based on previous studies, it was assumed that ultrasound is the only heating agent which can raise the temperature in and around the hip joint to therapeutic levels and which can be used safely in the presence of metallic implants. Physiologically, ultrasound increases extensibility of tight periarticular structures and scar tissues; it also has a pain-relieving effect. Thus, if used in conjunction with other physical therapy procedures, it could be anticipated that ultrasound would be most effective in treating the joint contractures which tend to develop in the elderly patient with hip fracture after internal fixation. A statistical comparison of the results obtained with ultrasound and those obtained with infrared showed that ultrasound was significantly more effective. The study also clinically confirmed the safe use of ultrasound in the presence of metallic implants.

The use of internal fixation and early mobilization in the case of the elderly patient sustaining a hip fracture has resulted in a greatly reduced mortality rate and, thus, a much improved prognosis.[1, 2] With the use of these newer surgical procedures, it has become possible to begin physical therapeutic measures, such as ambulation without weight bearing, shortly after surgery. Thus, the severity of the medical problem is decreased, and the patient becomes relatively self-sufficient and less of a nursing care problem.[3-5]

Despite this greatly improved over-all outlook for the patient with a hip fracture, functional recovery of the injured hip is often delayed or incomplete. Even with the best of care, disabling joint contractures have a strong tendency to develop, especially in the elderly patient. This situation is exceedingly difficult to combat, since the mechanical stability provided by the devices used for internal fixation does not allow vigorous therapeutic measures such as stretching. In order to improve the functional results obtained with the present methods of treatment, the need exists for a procedure which would not only prevent the development of joint contracture but also would not endanger the effectiveness of the internal fixation.

For the following reasons, it was assumed that ultrasound might be just such an effective adjunct to the presently used therapy after internal fixation of hip fractures. Gersten[6] found that ultrasound affected fibrous tissues, such as those found in scars, in such a way that the collagen fibers became significantly more extensible. It was determined that this effect was due, for the most part, to the rise of temperature resulting from the absorption of the ultrasonic energy. Moreover, it seems evident that ultrasound can be used to raise selectively the temperature in such tissues.[7] Consistent with these observations, ultrasound has been used successfully in the treatment of periarthritis of the shoulder.[8, 9] In addition, ultrasound has a pain relieving effect.[10] Furthermore, it was demonstrated that ultrasound is the only available type of diathermy which can raise the temperature of the structures of the hip joint to a therapeutic level,[11] and at the same time does not endanger the result of the internal fixation by selectively raising to an excessive degree the temperature of the metal implant or of the adjacent tissues.[12-14]

It was the purpose of the following study to investigate clinically whether or

This investigation was supported in part by a grant from the National Institutes of Health.

Professor and Executive Officer, Department of Physical Medicine and Rehabilitation, School of Medicine, University of Washington.
Assistant Professor of Clinical Psychology, Department of Physical Medicine and Rehabilitation, University of Washington School of Medicine.
Staff Therapist, King County Hospital.
Assistant Supervisor, King County Hospital.
Chief Physical Therapist, Department of Physical Medicine and Rehabilitation, University of Washington.

Read at the 3rd International Congress of Physical Medicine, Session on Physiatric Care Following Trauma, Washington, D. C., August 25, 1960.

not better results could be obtained when ultrasound was used as an adjunct to the standard post-operative treatment.

Type of Fractures Treated

For this study, patients with a unilateral femoral neck (Pauwel's type 1-2), or trochanteric fracture (type I) were selected after internal fixation of the fragments with such metallic implants as Smith Peterson, Neufeld, Jewett nails, Thornton side plate and Richard's screw and plate.

Methods of Treatment

Physical therapy was initiated on the 10th post-operative day. The patients were assigned at random (alternating assignment) to either one of two groups. One group was treated with ultrasound and the other with infrared. Ultrasound was applied with stroking technic to the anterior, posterior and superior aspects of the hip joint. Each area was treated for five minutes with an ultrasonic intensity of 1.0 to 2.5 watts/cm.^{2} and a total output of the applicator of seven to 17.5 watts.* Infrared was applied to the hip with a 1,000 watt lamp for 30 minutes. Otherwise, the patients of both groups were treated with exactly the same procedures. Their standardized program included the application of massage, active assistive exercises to increase the range of motion of the hip and knee joints, and gait training using a three-point gait, without weight bearing on the injured leg. Gait training was started in the parallel bars and was continued with underarm crutches or a walkerette. Treatments were given daily.

Methods of Evaluation[15]

The range of motion of the hip and knee joints was measured immediately before the initial treatment and was then rechecked at weekly intervals. For the evaluation of the hip extension, the method of Mundale and associates[16] was used. A reading on the protractor scale of "zero degrees" of flexion and extension of the hip was defined as the point where the shaft of the femur would be exactly perpendicular to a line drawn between the anterior and posterior superior spines of the ilium.

Statistical evaluations of the two groups of patients were made before treatment in order to determine if they were comparable both in available range of motion of hip and knee joints and in distribution of age and sex.

Table 1 shows that the two groups were statistically comparable on all joint motions except the hip adduction measure. The mean of this range of motion of the group later treated with infrared was greater than the mean range of motion of the group later on treated with ultrasound. The difference was significant at the five per cent level of confidence.

The random assignment of subjects into the two groups produced, by chance, a highly significant age difference. The mean age of the group treated with infrared was 79.07 years. When compared by t test with the mean age of 66.53 years of the group treated with ultrasound, the difference was found to be significant at the one per cent level. Therefore the effects of age on treatment had to be assessed. Age was correlated with the pre-treatment range of motion and amount of change in range of motion after one week of treatment, for all 30 subjects. These correlations are given in table 2. Since but one correlation, and this only barely, had reached a significant level, it was concluded that the age factor was not a significant variable in comparing the effects of treatment in this study.

The number of male patients in the group treated with ultrasound was nine as compared with one in the group treated with infrared. The possibility exists that this sex distribution may have influenced the therapeutic results, but the data do not suggest such a conclusion.

In summary, the two groups of patients seemed to be comparable for statistical purposes.

Statistical Comparison of Therapeutic Results

Table 3 shows the mean amounts of change after one week of therapy with ultrasound and infrared. The t tests reveal that ultrasound produced a signifi-

Table 1: Comparison of Available Range of Motion Prior to Treatment

	With Ultrasound (N = 15)		With Infrared (N = 15)			
	Mean*	S.D.	Mean*	S.D.	t	p
Hip						
Flexion	68.73	15.4	77.40	11.4	1.690	.20
Extension	20.27**	10.0	23.67**	8.9	.949	.40
Abduction	11.47	5.3	9.80	7.0	.710	.50
Adduction	9.53	5.0	13.87	5.8	2.127	.05
External Rotation	15.14	11.4	19.87	9.7	1.162	.30
Internal Rotation	12.50	9.7	14.53	11.4	.497	.70
Knee						
Flexion	104.80	34.2	98.67	28.1	.519	.70
Extension	4.20**	4.6	4.87**	3.8	.416	.70

*Goniometer readings at extreme of available range of motion.
**Readings represent amount of flexion contracture present.

Table 2: Correlation of Age with Pre-Treatment Range of Motion and with Amount of Change in One Week*

	Pre-Treatment (r)	One Week (r)
Hip		
Flexion	—.012	—.193
Extension	+.171	—.362
Abduction	—.066	+.282
Adduction	+.248	—.348
Internal Rotation	+.068	—.121
External Rotation	—.007	—.066
Knee		
Flexion	—.206	—.133
Extension	+.262	—.161

*N = 30 for all correlations. With 28 degree of freedom, r would have to reach .361 to be significant at 5% level.

cantly greater amount of change than does infrared at a one per cent level of confidence for all motions except knee flexion.

As will be noted below, in the instance of hip adduction, that amount of the variance in range of motion after one week of treatment attributed to the difference in the pre-treatment range of motion was taken out by co-variance. The residual variance showed by **F** test a significantly greater amount of change in the ultrasound group than in the infrared subjects. This shows that differences between the two groups after one week of treatment cannot be accounted for on the basis of difference in pre-treatment range of motion.

Table 3: Comparison on Amount of Change in Range of Motion After One Week of Treatment**

	With Ultrasound			With Infrared				
	N	Mean	S.D.	N	Mean	S.D.	t	p
Hip								
Flexion	15	21.67	9.7	15	5.40	11.4	4.057	.01
Extension	15	10.40	8.2	15	—3.20*	7.7	4.503	.01
Abduction	15	06.33	7.4	15	—1.67*	5.6	3.225	.01
Adduction	15	09.67	6.6	15	—1.20*	6.0	4.567	.01
External Rotation	14	12.86	7.9	15	0.20	7.9	4.178	.01
Internal Rotation	14	10.93	7.6	15	—1.60*	8.8	3.965	.01
Knee								
Flexion	15	18.33	14.9	15	10.33	13.3	1.498	.20
Extension	15	03.60	3.9	15	—3.47*	4.8	4.259	.01

**US and IR groups compared using independent samples method.
*When the mean is expressed as a negative value, range of motion has been lost during treatment.

The results of treatment for two to three weeks are summarized in table 4. These data also suggested that ultrasound is more effective in improving the range of motion than is infrared; however, a statistical analysis was not attempted. There were too few cases to analyze properly either the amount of change in range of motion or the special character of the cases which dropped out. Some left because they had obtained maximum benefit from the treatment, but others left for miscellaneous reasons unrelated to this study.

Having established that ultrasound produces significantly more effects than infrared under the conditions of this study, there remained the question as to how much effect either modality had on range of motion. Using each patient as his own control, the amount of change in range of motion after one week was compared with the pre-treatment range of motion. This was done by *t* test, using the "matched pairs" method. The results of this analysis are given in table 5. They show that for all eight joint motions, ultrasound produced mean ranges of motion after one week of treatment that were significantly greater at a one per cent confidence level than the pre-treatment values. In contrast, in five of the eight joint motions, infrared produced no significant change. For hip flexion, the mean range of motion after one week of treatment approached being significantly greater than the pre-treatment range of motion ($p = .10$). For knee flexion, there was a significant increment after a week of treatment ($p = .02$). However, for knee extension, there was a significant decrease in range of motion after one week of treatment ($p = .02$). These data indicate that ultrasound has a consistent effect on range of motion which is statistically significant for all eight joint motions but that infrared tends to have only a slight effect under the same conditions.

Further statistical evaluation indicated that a relationship existed between pre-treatment range of motion and amount of change after treatment. This relationship was assessed by correlations, as shown in table 6. The findings show that in all motions, with the exception of hip

Table 4: Amount of Change in Range of Motion After Two and Three Weeks of Treatment as Compared with Pre-Treatment Measurements

		Two Weeks		Three Weeks	
		Ultrasound (N = 14)	Infrared (N = 13)	Ultrasound (N = 10)	Infrared (N = 10)
Hip					
Flexion	Mean	27.07	09.15	29.90	07.40
	S.D.	12.0	8.2	13.6	13.2
Extension	Mean	10.43	02.62	09.60	02.20
	S.D.	6.0	10.3	6.1	12.3
Abduction	Mean	08.93	—0.62*	10.20	.50
	S.D.	6.8	7.2	5.4	7.7
Adduction	Mean	10.21	—0.59*	09.80	—1.10*
	S.D.	6.5	8.2	5.8	6.9
External Rotation	Mean	17.36	—1.15*	14.60	.80
	S.D.	9.1	6.9	8.3	7.4
Internal Rotation	Mean	12.57	—1.54*	11.70	—0.20*
	S.D.	8.7	8.0	7.1	8.4
Knee					
Flexion	Mean	24.93	17.15	23.50	22.70
	S.D.	15.3	18.6	19.5	17.9
Extension	Mean	04.50	—0.54*	05.40	—0.80*
	S.D.	4.6	3.3	4.9	3.8

*When the mean is expressed as a negative value, range of motion has been lost during treatment.

Table 5: Evaluation of Amount of Change Produced by Each Modality After One Week of Treatment*

	Ultrasound				Infrared			
	N	Mean Change	t	p	N	Mean Change	t	p
Hip								
Flexion	15	21.67	8.360	.01	15	5.40	1.772	.10
Extension	15	10.40	4.746	.01	15	—3.20**	1.555	.20
Abduction	15	6.33	3.201	.01	15	—1.67**	1.116	.30
Adduction	15	9.67	5.484	.01	15	—1.20**	.748	.50
External Rotation	14	12.86	5.872	.01	15	.20	.094	.99
Internal Rotation	14	10.93	5.187	.01	15	—1.60**	.680	.60
Knee								
Flexion	15	18.33	4.604	.01	15	10.33	2.906	.02
Extension	15	3.60	3.454	.01	15	—3.47**	2.706	.02

*All t tests based on the differences between pre-treatment ROM and ROM after one week of treatment, using the matched pairs method.
**When the mean is expressed as a negative value, range of motion has been lost during treatment.

Table 6: Correlation of Pre-Treatment Range of Motion with Amount of Change After One Week of Treatment*

	(r)
Hip	
Flexion	—.584***
Extension	+.391**
Abduction	—.048
Adduction	—.790***
External Rotation	—.454**
Internal Rotation	—.499***
Knee	
Flexion	—.538***
Extension	+.258

*N = 30 for all correlations
**Significant at 5% level, with df = 28.
***Significant at 1% level, with df = 28.

abduction and knee extension, a significant correlation exists between range of motion before treatment and amount of change; that is, the greater the range of motion before treatment, the less the change with treatment. Since in all but one case the range of motion before treatment was not significantly different in the two groups of patients, the comparison of the therapeutic efficacy of ultrasound and that of infrared could be made without taking this factor into consideration. The only exception was the significant difference in hip adduction. The effects of the difference in range of motion before treatment on the amount of change during treatment were estimated by the analysis of the co-variance as discussed previously.

Further clinical observations suggested that the patients of the group treated with ultrasound became self-sufficient at a somewhat faster rate and to a greater degree than those treated with infrared. This impression could not be substantiated by statistical means because of the relatively small number of cases.

Side Effects

There were no complications or untoward effects observed in either group of patients that could be attributed to the treatment. X-ray films obtained before and after treatment showed that good alignment of the fracture was maintained and healing progressed at a satisfactory rate. Only in one case treated with ultrasound could it be demonstrated that a nail backed out a few millimeters. This was attributed to the severe osteoporosis which existed before fracture and which was resolving after treatment.

Summary

Based on previous studies, it was assumed that ultrasound is the only heating agent which can raise the temperature in and around the hip joint to therapeutic levels and which can be used safely in the presence of metallic implants. Physiologically, ultrasound increases extensibility of tight periarticular structures and scar tissues; it also has a pain relieving effect. Thus, if used in

conjunction with other physical therapy procedures, it could be anticipated that ultrasound would be most effective in treating the joint contractures which tend to develop in the elderly patient with hip fracture after internal fixation.

A statistical comparison of the results obtained with ultrasound and those obtained with infrared showed that ultrasound was significantly more effective. The study also confirmed clinically that ultrasound can be used safely in the presence of metallic implants.

Acknowledgment: We would like to thank the Division of Orthopedic Surgery for their cooperation through which this study was made possible.

*The ultrasonic generator, Model No. UT-1, was furnished for this study through the courtesy of the Burdick Corporation.

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Information relative to securing reprints of this study may be had by checking the Reader Service column on page iv of this issue.

Independence? That's middle class blasphemy. We are all dependent on one another, every one of us on earth.

—GEORGE BERNARD SHAW

Functional Electrotherapy: Stimulation of the Peroneal Nerve Synchronized with the Swing Phase of the Gait of Hemiplegic Patients

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David Scot, R.P.T.
and
Margot Dow, R.P.T.
Hines, Illinois

● The concept of "functional electrotherapy" implies the use of electrical stimulation in the process of carrying out effective movements by activating muscles which are paralyzed as a result of upper motor neuron involvement. This study is the beginning of the development of a research program inspired by the concept of "functional electrotherapy." In hemiplegic patients with foot drop, the electrode, made of conductive rubber, is applied to the skin area where the common peroneal nerve may be stimulated – below the knee. A large dispersive electrode is applied to the thigh or lower leg. A transistorized stimulator, which can be placed in the patient's pocket, is used. Thus, pulses of 20 microsecond duration of sufficient voltage, at a frequency of 30 per second may be applied. The electrical circuit is interrupted by a switch which is located in the sole of the shoe on the involved foot. The circuit is so arranged that during the swing phase, the stimulating current is on, while during the stance phase, it is off. With this arrangement, the gait of the patient is considerably improved without any bracing as the patient dorsiflexes the foot in the correct manner. During this study it was disclosed that the spontaneous dorsiflexion also is progressively improved. Therefore, the possibility of a carry over of the effects of "functional electrotherapy" on the effectiveness of the spontaneous gait of the patient also may be considered.

Classical electrotherapy as used in departments of physical medicine and rehabilitation involves stimulation of nerves and muscles applied for one of the following reasons:

1. To forestall or prevent muscle atrophy when voluntary contractions are impossible or non-desirable.
2. To maintain the denervated fibers in a state of vitality until the onset of the nerve regeneration.
3. To effectuate a milking effect in case of a vascular insufficiency.
4. To increase the strength of the muscle in cases of muscular disbalance and an impossibility or non-desirability of voluntary contraction.
5. To re-educate the movement by demonstrating to the patient the contraction of his muscles; for instance, in cases of hysteria or a return of function after paralysis.

The common characteristic of all these applications of electrotherapy is that it implies a lasting therapeutic effect which will persist after the treatment series for a certain time.

To this classical electrotherapy of muscles, we like to oppose a concept of another kind of electrotherapy which we call "functional" electrotherapy. The objective of functional electrotherapy is to provide the muscles with electric stimulation in cases of the central nervous system lesion (as for instance in hemiplegic and paraplegic patients) so that *at the very time of the stimulation* the muscle contraction has a functional purpose either in locomotion or in prehension or in other muscle activity. In other words, functional electrotherapy is a form of replacement therapy in cases when the impulses coming from the central nervous system are lacking. Functional electrotherapy may be conceived in order to permit the paraplegic patient to stand up or perhaps walk and hemiplegic patients to correct the faulty patterns of prehension or the gait. With the present day progress of electronic technics, the possibilities in this field are only barely visualized. Clearly, there are three factors which may prevent or hamper functional electrotherapy. They are: 1. the pain which the patient may experience during electrical stimulation; 2. the spasms which may be set up by the stimulus; and 3. the difficulty to "feed in" a coordinated pattern of muscle behavior, plastic enough to meet all the requirements of a constantly changing environment.

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Read at the 3rd International Congress of Physical Medicine, Session on Neuromuscular Diseases, Washington, D. C., August 25, 1960.

Pain seems to be minimized in cases of paraplegia for obvious reasons and it does not appear to be an unsurmountable factor in hemiplegia. In order to render the electrical stimuli as painless as possible, one should apply pulses of brief duration (below one microsecond) as the chronaxie of the pain receptors is relatively long.

The spasm does not appear in hemiplegic patients, but constitutes a real problem in paraplegics and still awaits a solution.

The complexity of the requirement of a plastic response due to the changes of environment will certainly limit the application of functional electrical therapy even though electromyographic and accelerographic studies showed simplicity of patterns in locomotion under ordinary conditions.[1] It is because of the complexity of the locomotion patterns in a changing environment that our initial attempts were made in the simplest possible cases. Such a case is realized by the foot drop in an hemiplegic patient, due to the weakness of the dorsiflexors, particularly the evertors and resulting in a circumducted dragging or shuffling gait. Although this is a relatively minor disability, it prevents the stability of the whole leg and, therefore, impairs the balance of the patient. The use of a short leg brace is an accepted solution, although it constitutes a nuisance to the patient. The following is a brief account of our initial attempts to apply an "electrophysiologic brace."

Subjects and Methods

Subjects. Seven hemiplegic patients were treated, five left-sided and two right-sided. Ages ranged from 48 to 67. All the patients had a foot drop with a prominent inversion of the foot and pronounced gait difficulties.

Stimulators. Several stimulators were tried out. All of them have in common the following features:

1. They are transistorized.
2. Pulse durations are between 20-250 microseconds.
3. The peak current is below 90 ma.
4. Frequency of repetition is 30-100 c/sec.

Each stimulator is of the size of a cigarette to a cigar box; can be easily placed on the belt of the patient; a voltage control can be operated by the patient. The function of the battery can be maintained from one week to one month according to the amount of activity.

Electrodes. Several types of electrodes were tried. At first a diffuse electrode, consisting of a conductive rubber plate, was placed on the thigh over the quadriceps. Later, we changed the position of the diffuse electrode and applied it over the tibialis anticus. We are experimenting with a diffuse electrode attached to the same strap which is used to apply the active electrode.

The active electrode consists of an electroencephalograph-type of electrode covered with conductive rubber. It is quite difficult to localize exactly the point where the peroneal nerve is most easily stimulated. For this reason, we have used a specially constructed electrode with a built up elastic material permitting a better application behind the head of the fibula (fig. 1). We also have tried to

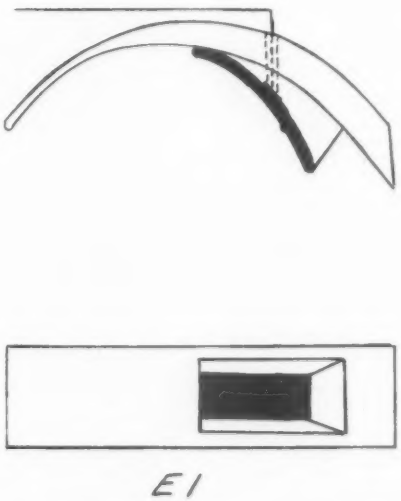

Fig. 1 — Diagrammatic representation of the active electrode. Conductive rubber in black. Above: Side view. Below: Front view. E1 is active electrode.

construct a multiple electrode with four different locations. In this way the therapist or the patient can localize the peroneal nerve with a minimum amount of trouble.

Foot Switch. In order to synchronize the stimulation of the peroneal nerve with the gait phase where such stimulation will be the most helpful, we incorporated the switch in the sole of the shoe. This switch permits the temporary introduction of a shunt when it is closed. In other words when the patient has his foot on the floor, the switch closes a circuit containing a shunt in parallel with the patient. Under such conditions the peroneal nerve is not stimulated and the foot is relaxed. There is no need for the stimulation at that time as the foot is supported by the ground. As soon as the patient lifts his foot off the ground, the switch is opened and the current flows through the peroneal nerve. At that time, the foot is in dorsiflexion and eversion (fig. 2 shows the general arrangement).

Results

In all the subjects without exception a considerable improvement of the gait was obtained during application of the current to the peroneal nerve as described before (fig. 3). In general, the current has been tolerated by the patients and the maximum peak of 250 volts, 90 ma, 250 microseconds was never exceeded. However, one patient preferred not to use the electrophysiologic brace.

The application of the brace continues to require special attention as the point of stimulation is quite critical. However, with proper care, this difficulty is easily overcome.

A remarkable observation has been made which needs further study. On several occasions we observed, after training with the electrophysiologic brace as described, that the patients acquire the ability of dorsiflexing the foot by themselves. There is a sort of conditioning which is manifested particularly for the activity of the tibialis anticus. However, these periods of spontaneous activity are only transitory and a reinforcement of functional electrotherapy seems necessary.

Discussion

It seems, therefore, that functional electrotherapy may be applied to the correction of the hemiplegic gait. We have not found any skin reaction so far,

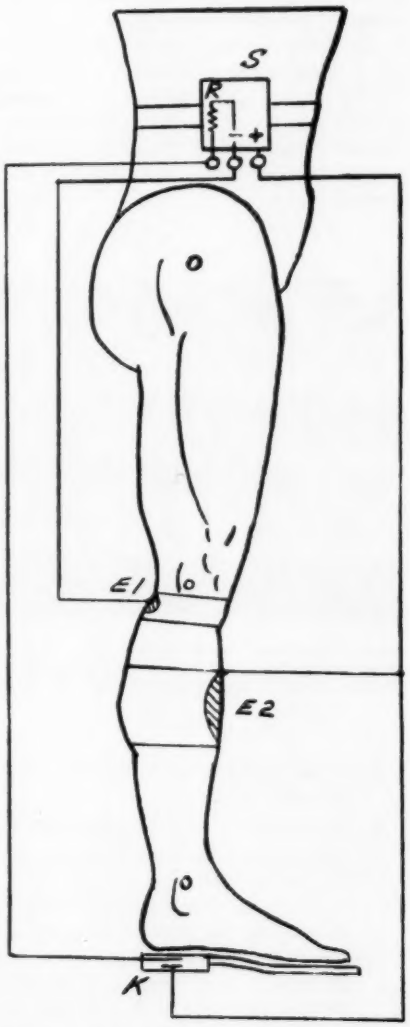

Fig. 2 — General arrangement of the functional electrotherapy of the foot drop in hemiplegic patients.
S: Stimulator R: Shunt
E1: Active Electrode E2: Inactive Electrode
K: Foot Switch

but of course our experience is still very limited. The discomfort does not seem to present an outstanding problem, except in one patient who preferred not to use the brace. Of course, our information has been limited so far to the initial phase of the therapy. Information is still needed in order to determine how long the hemiplegics will be willing to use this artificial stimulation of their peroneal nerve during their daily activities. Further research in order to determine this point is now being planned. It is possible that when other larger muscles are stimulated for the same purpose, such as for instance quadriceps, the discomfort may be considerably more of a problem. Several avenues for attacking this problem are opened:

1. Denervation of the skin underlying the electrode.
2. Construction of a multiple stimulator producing asynchronous discharges applied to several points of the muscle. Our experience so far shows that the further decrease of the pulse duration does not seem to result in a more comfortable perception. As a matter of fact, at this level of skin stimulation, most of the discomfort comes from a synchronous contraction of the entire muscle which is contrary to what takes place under physiologic conditions. So far, patients have not clearly indicated their preference for 20 microsecond pulses as against .3 milliseconds.
3. A secondary interruption of the tetanizing current may also be of help.
4. It is possible that for some patients a topical anesthetic could be used.

Summary

Functional electrotherapy is defined as a replacement electrotherapy applied in patients with a central nervous system lesion, so that at the very time of the stimulation, the muscle contraction has a functional purpose either in locomotion or in prehension or in other muscle functions.

The first attempt of the functional electrotherapy has been described. It consists in using a portable transistorized stimulator delivering pulses of 20 to 250 microseconds duration at a frequency of 30 to 100 c/second. The current is applied to the peroneal nerve, the dispersive electrode being located over the tibialis anticus. The current is interrupted by a switch located in the sole of the shoe. The circuit is arranged in such a way that the dorsiflexion is activated when the foot is off the floor.

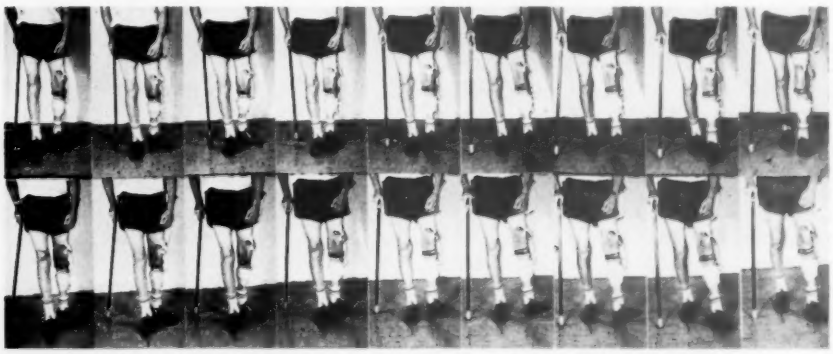

Fig. 3 — This figure shows one complete cycle in the gait of the hemiplegic patient with no stimulation in the top row and with stimulation applied to the peroneal nerve in the lower row. Note the lack of dorsiflexion and a pronounced inversion without stimulation and a good dorsiflexion with stimulation.

In some patients a carry over of this functional electrotherapy is observed as their spontaneous dorsiflexion seems to improve.

Reference

1. Liberson, W. T.; Holmquest, H. J., and Halls, A.: "Accelerographic and Electromyographic Techniques of Gait Recordings" presented at the Pan American Congress, Mexico City, Mexico, May, 1960.

Information relative to securing reprints of this study may be had by checking the Reader Service column on page iv of this issue.

We hold these truths as self-evident, that all men are created equal and independent; that from the equal creation they derive rights, inherent and unalienable, among which are the preservation of life, liberty, and the pursuit of happiness.

—THOMAS JEFFERSON

Second Year Review of Evaluating and Classifying the Vocational Potentials of the Cerebral Palsied

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● A follow-up study of the vocational rehabilitation of the cerebral palsied adults for more than two years is presented. The job sampling technic is employed to estimate the vocational potential. A total of 188 clients were screened; 84 of them were approved for admission to the seven week project. During this time the team of workers carefully evaluate each patient and periodically meet and discuss them. The classification of each patient is given in four categories as the practical result of this study. Methodology of predicting employment of cerebral palsied is presented.

The Work Classification and Evaluation Project for the Cerebral Palsied was established at the Buder Youth and Adult Center, St. Louis, Mo., in April, 1958. The purpose of the program is to evaluate and classify the work ability and/or potentials of the cerebral palsied.

The "job sample" technic of determining the vocational potential is utilized in our procedures as it reproduces a work-like situation in which all of the necessary components of a job are reproduced as closely as possible. The job sample method considers a person's physical, mental, and emotional makeup as well as the standards required by industry. With this technic it is possible to give an accurate picture of the person's ability to do the real job.

Description of Project

The criterion for admission to the project is as follows:

1. There must be a specific diagnosis of brain damage which creates a vocational handicap. If there are seizures, they must be under control.

2. There should be reasonable assurance that the individual can function within the project environment.

The project is of seven weeks' duration, five days a week from 9 a.m. to 3 p.m. The team of evaluators is composed of the Project Director, a physiatrist, a job sample evaluator, an occupational therapist, a vocational counselor, a social worker, and a speech therapist.

The basic areas of exploration are as follows:

1. Manual dexterity.
2. Vocational tools.
3. Vocational equipment.
4. Academic skills.

There are 14 basic categories of samples which include 77 job areas. These 77 job areas include 171 samples.

Discussion

Since April 1, 1958, a total of 188 clients have been screened for possible admission to the project. Only 98 were considered to have the needed potential for submission to the Admission Committee. Of the 98 presented to the committee, 84 were approved for admission. The remaining 14 were felt to be at their maximum level of rehabilitation.

Our analysis is based on the 73 clients actually completing the program. There were more quadriplegics than any other disability. There was a severe speech problem in 48 per cent of the cases. The average age was 24. The age range was from 16 to 47. There were 17 females and 36 males. Eighteen per cent were not ambulatory and 61 per cent of the ambulatory cases had a noticeable gait disturbance.

It is significant to note that we are working with the more adequate of the cerebral palsied population. Even so, 42

This Demonstration and Research Project was made possible by funds from the Federal and Missouri State Offices of Vocational Rehabilitation.

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Read at the 3rd International Congress of Physical Medicine, Session on Cerebral Palsy, Washington, D. C., August 25, 1960.

per cent of this group has speech difficulties that would not be practical for vocational use.

The result of the project performance was a practical classification as follows:

Classification	No. of Clients	%
I. The individual is ready for direct placement in a given job as shown by performance.	21	29%
II. The individual is recommended for training in a specific job area as shown by performance.	10	14%
III. The individual is recommended as having sheltered workshop potential at the time of evaluation.	17	23%
IV. The individual at this time is not feasible for vocational rehabilitation.	25	34%
Total	73	100%

Statistical information is included in tables 1 through 5.

It is impossible to say specifically just what the vocational future of our cerebral palsied population might be. The findings in St. Louis indicate that 29 per cent of those completing the project have vocational potential. When one considers the total number screened, the percentage becomes only 11 per cent, this is perhaps more significant. This percentage will vary from place to place, just as the vocational future of any young person will differ according to where he is, what he can do, and how well he can do it. These are all considerations that must be answered by anyone seeking a vocational future. For the cerebral palsied person this is even more complex. Seventeen were placed on jobs, only seven are still working at the present time. The others were unable to perform on jobs.

In analyzing the job sample performance of the cases, a wide range is noted in almost each category of testing, with a majority of the cases falling in a substandard category. It is obvious that we did not approach a normal curve of distribution of performance. Our findings to date indicate that there is a significant relationship between years completed in school and work potential. A recent survey of 15 of the successful cases[1] when compared with 15 unsuccessful cases picked at random, show years in school to be more significant for employment than reading ability, manual dexterity and I.Q. level.

Clients with high intelligence quotients did not necessarily perform the job samples easier or better than those with low intelligent quotients. Where the I.Q. is average or better the chances for employment are greater even when the job sample performance is below standard.

It appears as if those staying in school longer have developed more acceptable personalities and better personal relationships. These attributes then make them more acceptable as employees.

Table 1: Diagnosis

	Number
1. Spastic	36
2. Athetoid	18
3. Rigidity	1
4. Ataxia	6
5. Tremor	1
6. Atonic	0
7. Mixed	11
Total	73
1. Left Hemiplegia	10
2. Right Hemiplegia	8
3. Monoplegia	2
4. Paraplegia	11
5. Quadriplegia	42
Total	73

Table 2: Speech

	Number	%
No speech problems	38	52%
With speech problems	35	48%
Total	73	100%

Table 3: Intelligence

I.Q.	Number
111 - 120	5
90 - 110	20
70 - 89	19
50 - 69	21
- 49	8
Total	73

Table 4: Previous Work Experience

With one year or more work experience	20
Without work experience	53
Total	73

Table 5: Final Classification and Results

Classification	Clients
I	21
II	10
III	17
IV	25
Total	73
Number of clients placed in employment	17
Number of clients in training	8
Number of clients in sheltered shops	3
Total	28

After more than two years experience in observing the behavior of clients from smaller communities as compared with clients from the metropolitan areas, we feel that the clients from the smaller communities adjust more readily to the work environment of the project.

We are still endeavoring to determine specifically, what it is that successfully rehabilitated cerebral palsy clients have that is absent in the unsuccessful cases. We do know that the ability to handle money, to be able to meet and to work with others is significant.

Summary

During more than two years, 188 cerebral palsied persons were screened. Their average age was 24 years. One-third of those completing our project has vocational potential. Significant factors are presented, most important in our opinion is adjustment.

Reference

1. Collins, H. A., and Boyd, F.: Four Factors and Their Influence on the Vocational Rehabilitation of the Cerebral Palsied Adult. Unpublished paper.

Information relative to securing reprints of this study may be had by checking the Reader Service column on page iv of this issue.

The Bird of Time has but a little way to flutter
— and the Bird is on the Wing.

— OMAR KHAYYAM

Function of Home Evaluations in Discharging Rehabilitated Severely Disabled from the Hospital

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Beth H. Fowles, B.S.
and
Susan P. Mahan, O.T.R.
Cleveland

● One of the characteristics of the progress in rehabilitation methods is the blurring of the boundaries between the hospital and the patient's home. Some essential aspects of the physical and psychosocial atmosphere of the home are being introduced into the hospital, and reversely, the hospital is a more integral part of the community. Home evaluations play a considerable role in the transition of the rehabilitated severely disabled from the hospital to his home. We review the experiences gained from home evaluations done from Highland View Hospital. Particular problems of the hemiplegic patient, the patient with a fractured hip, the double above-knee amputee, the spinal cord injured patient, especially the quadriplegic, and the multiple sclerosis patient with advanced disability are discussed in some detail.

One of the characteristics of the progress in rehabilitation during the last two decades is the expansion from predominantly vocational retraining to more general rehabilitation services, including retraining those physically handicapped who can no longer work to at least be able to live at home independently. Another characteristic is our increasing attention to the more severely involved person, both the aged disabled and the handicapped child.

Both our knowledge of and our experience with these patients are accumulating very slowly, and the efforts to systematize and verbalize our findings have been rather inadequate so far. This particular paper is a report on one aspect, namely, the function of the technic of home evaluations in enabling some of the severely disabled to return to their homes when the maximum benefit from inpatient rehabilitation treatment has been achieved. We do not claim to have originated the idea of doing home evaluations, but we do think that the type and number of our cases as well as the degree to which the staff at Highland View Hospital has perfected the technic justify this presentation.

The basis for the concept of home evaluations is the general belief that, whenever feasible, the place for a chronically ill or severely disabled person is in his home. We do feel that many of these patients need prolonged hospitalization to provide them with maximal medical, surgical, and rehabilitation services, but once realistic goals for enabling the patient to use his remaining abilities to the utmost have been achieved, or when he has progressed to the point that the family can continue the treatment at home with the regular supervision of trained personnel, every reasonable effort should be made to place the disabled person back in the natural environment of home and family. In more and more instances the full responsibility for the care of the severely disabled does not have to be assumed by community agencies or institutions. Instead we try to make it easier for the family to care for their own disabled members, with the guidance from community agencies available when needed, because we believe that they should not be deprived of those cultural privileges which can best be nurtured and maintained only in a healthy family setting. The balance between family responsibility and community responsibility is labile in general, and difficult to ascertain in particular instances. America is at a stage of social-medical development where, if we are not careful, more or less glorified cemeteries for the living but physically disabled will multiply, as happened for the psychiatrically handicapped.

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Chief Physical Therapist, Department of Physical Medicine and Rehabilitation, Highland View Hospital.

Chief Occupational Therapist, Department of Physical Medicine and Rehabilitation, Highland View Hospital.

Read at the 3rd International Congress of Physical Medicine, Session on Medical Problems Diagnosed or Treated by Physical Medicine, Washington, D. C., August 25, 1960.

Highland View Hospital is a modern chronic disease hospital and a teaching hospital of Western Reserve University School of Medicine. It is supported by county funds and serves the greater metropolitan Cleveland area. We have all the diagnostic and treatment facilities of a good general hospital, but we specialize in the care of, teaching about, and research in chronic illnesses and disabilities. Although it is expected that eventually the general hospitals in our community will be able to adequately care for the majority of these patients, we believe that a chronic disease hospital, as an integral part of the community facilities, will still be justified especially because of its teaching and research functions as well as the easier availability and more economic use of the scarce specialized personnel and facilities.

In 1953, the year Highland View Hospital opened, about 100 patients were discharged from the hospital, but only eight per cent of them went home. In 1956, the discharges had grown to 329, of which 60 per cent went home; and in 1959, 80 per cent of the 611 patients discharged from the hospital were discharged home. It can be seen from the data (fig. 1) that the patient turnover in our chronic disease hospital is steadily growing, that there is an increasing percentage of patients being discharged home, and therefore, that the personnel and facilities of this hospital are serving an increasing number of chronically diseased and disabled persons. The hospital could not provide this service without the understanding and cooperation of the physicians and the health and welfare agencies in the greater Cleveland area. Several other factors have made this increase in discharges home possible: our admission policy, close social service contact, week-end home visits, and home evaluations.

We try to admit only those patients who, according to our experience, we feel will really profit from the medical, surgical, and rehabilitation facilities of the hospital. Also, the length of time

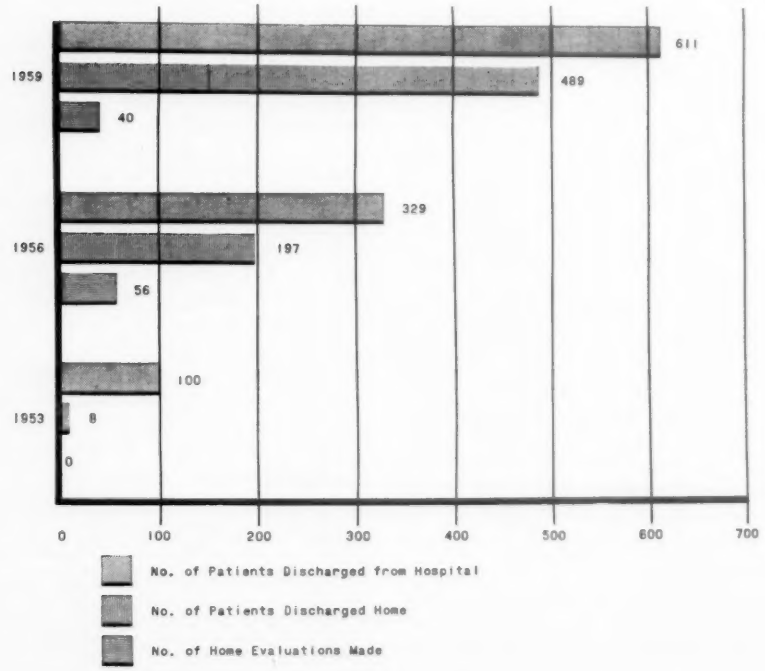

Fig. 1

between the onset of the disease episode which has led to hospitalization and the actual beginning of the concentrated rehabilitation program at the hospital has been diminishing gradually. Thus we can treat the patient earlier in the course of the illness and cut down the occurrence of complications, such as contractures, which can influence not only the outcome of his treatment but also the eventual decision as to whether the patient will be accepted at home at the time of discharge or will have to be placed in a nursing home. This diminished time gap between onset and treatment also tends to prevent deterioration of the bonds between the disabled member and the rest of the family.

Each newly admitted patient and his family have a social service interview, and this social service contact is maintained with the family during the entire hospitalization of the patient. This is another means by which we can possibly prevent or at least lessen the deterioration of the relationship between the family and its chronically ill or disabled member and thus increase the chances of the patient's returning home.

The family is encouraged to visit the patient as often as possible (our visiting hours are from 10 a.m. to 9 p.m. and there is no limit on the number of visitors), and members of the family are encouraged to participate in his treatment in the Department of Physical Medicine and Rehabilitation so that they learn to use the technics by which we teach the patient to be independent in ambulation and other activities of daily living. During these contacts the family is actually confronted with what the patient can do and what he cannot do for himself. This not only alleviates the major factor of the family's "fear of the unknown" but also enables the management or assistance needed by the patient to become a routine for the family.

We encourage the patient to spend weekends at home. These home visits give us an opportunity to learn what the patient's real problems at home are, and we can then try to find practical solutions to them before he is discharged.

An essential feature in the integration of the hospital with the home and with the community is that part of the home atmosphere and some physical features found in the home should be available in the hospital. For instance, we have low beds for our patients to use when their nursing care no longer requires their being in the typical high hospital bed and/or when the patients have become independent in getting in and out of bed, and we have dining rooms on the wards where the patients can eat in a more home-like situation, not while lying in bed.

Also within the realm of "manipulating" the family-patient relationship is the hospital's pre-discharge guidance to the family and the organization of future assistance from other community agencies. Whenever it is found advisable, our physical medicine and rehabilitation staff accompanies the patient to his home a few days before his discharge date to evaluate what changes at home will be necessary to make his independence there feasible, or to make his care at home easier.

Experience has taught us that after discharge home some patients no longer use those abilities they learned while in the hospital. Another function of the home evaluation is to diminish or prevent this occurrence. For instance, a hemiplegic patient who climbed stairs easily in the hospital may not do it at all at home unless he is actually shown that he can during the home evaluation visit. Now, using the Katz Activities of Daily Living Index,[1] we record how our discharged patients actually perform at home.

Home evaluations also give our staff an opportunity to compare the real life situation with the hospital training situation so that their treatment of the patients can have a more practical approach.

I would like to point out that these home evaluation visits are actually one of the means by which society exerts pressure on its members to accept family responsibility. The fact that someone outside the immediate family circle not only wants to know how the disabled member is living at home but is also willing to do everything possible to enable him to continue living at home, very definitely influences the relationship

between the disabled person and his family. This pressure may be more necessary in the United States than in other countries because the American people do more moving from city to city or from one neighborhood to another and thus are less subjected to local community cohesive attitudes than are European families who tend to occupy the same homes or live in the same communities for generations.

The many technical details covered during the home evaluation visits are described elsewhere.[2, 3] This paper will concentrate on general findings.

It has become a fairly well accepted fact that a paraplegic patient can and should live at home, work, and, in most instances, drive himself to and from work. Now spinal cord injury wards or hospitals equipped to take care of spinal cord injured patients have an increasing number of their beds occupied by the more severely involved quadriplegics, who are often in their teens or early twenties. We have been successful in discharging home almost all of our quadriplegics who have reached the maximum of physical rehabilitation. However, no pressure is exerted on them to leave the hospital, and they can be re-admitted at any time. During their home evaluations we are concerned with the existence of adequate space in the home for easy maneuverability of the fairly large quadriplegic wheelchair. We also want to be assured of the full-time availability of an able-bodied person in the home. Usually this is a member of the family, but occasionally it is a person outside the family circle who has agreed to live in. We must also be sure that the special equipment mandatory for most quadriplegic patients to function even in their limited way is easily accessible and properly placed. The services of the Visiting Nurse Association are very helpful in these cases, and an area nurse is routinely invited to see the patient in the hospital during the last few days of his hospitalization and to be present during the actual home evaluation. We have often been surprised at the cooperation of the families in making essential adjustments at their homes and the success of the quadriplegics' living at home.

The far-advanced bedridden or wheelchair dependent multiple sclerotic patient is often admitted to our hospital for just a few weeks to ascertain whether and in what way we may be helpful in making it possible for him to continue to live at home. As with many disabilities where the deterioration proceeds very gradually and through a long period of time, we very often learn a great deal from the families' and the patients' own methods of solving their problems. The purpose of hospitalization, then, is to superimpose our more technical knowledge on the patient's and the family's own experiences, as well as to try out the practicality and acceptance by the patient of new technics. Here the home evaluation determines whether the recent hospitalization was justified. In most instances, these patients are hospitalized permanently only when they are at the stage where placement in even a good nursing home would be of no benefit.

The elderly bilateral above-knee amputee can be trained to be wheelchair independent in two or three weeks of hospitalization. Then the main problem is a proper rearrangement of his home: convenient height of bed, toilet seat, and a comfortable armchair, and adjustment of the kitchen to allow all activities to be done from the level of his amputee wheelchair (wheelchair with the axle set back two and one-half inches to compensate for the loss of the weight of the amputated lower extremities). The bilateral above-knee amputee who is blind is a special case requiring special adaptations in his home environment.

The two most common disabilities in need of hospital rehabilitation services are hemiplegia and a fractured hip. Because of our extensive experience with home evaluations in these two instances, our staff can now limit itself to an interview type of home evaluation. Only on rare occasions is an actual home visit made. Minimal changes are suggested because we know that the brain injured patient (the fractured hip patient often belongs in this group) does better in the familiar surroundings of his home than when too many changes have been made.

For instance, we may even go so far as to advise the family to delay going to the expense of installing an elevated toilet seat for several weeks, even if the patient were trained to use one in the hospital, until it is determined whether the still slowly improving patient may be able to manage without it. We are more concerned with seeing that the family and the patient have actually practiced (during the week-end home visits) all the technics the patient learned at the hospital and that the difference between the training situation at the hospital and the living situation at the home can really be bridged, i.e., the brain injured patient has really learned to overcome the typical problem of transferring experiences from one setting to another.

In summing up our experiences with home evaluations we would like to stress that, in selected cases, a home evaluation is a very essential factor in enabling the disabled to live at home. It is a part of the general method of alleviating the patient's and his family's "fears of the unknown." It demonstrates that the care of the disabled at home is within the family's abilities. It is an excellent training situation for our own staff, and makes the work at the hospital more true to life. It plays a basic role in the integration of the hospital with the community.

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Information relative to securing reprints of this study may be had by checking the Reader Service column on page iv of this issue.

Give me a lever long enough, and a fulcrum strong enough, and single-handed I can move the world.

— ARCHIMEDES

Systematic Classification of the Chronic Sequelae of Poliomyelitis

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and
William A. Spencer, M.D.
Houston

● The invasion of the central nervous system by the viruses of poliomyelitis has direct and indirect effects upon other systems of the organism. This may produce multiple clinical syndromes at different stages of the chronic phase of the disease. Some of these syndromes are the cause of early death in many patients. In others, the depletion of physiologic reserves appears to lead to premature aging of some physiologic systems. Experience acquired in the last 10 years in poliomyelitis respiratory and rehabilitation centers has led to identification and description of several syndromes that complicate the course of chronic poliomyelitis. A systematic classification of these chronic sequelae is presented and its relative incidence in the three major "anatomic" forms of poliomyelitis is indicated. Special emphasis ought to be given to the avoidance of injudicious scheduling of physical activities and treatments in individuals with residual paralysis of the respiratory muscles. An early diagnosis of these sequelae and the establishment of their immediate treatment are possible only by means of periodic examinations of the poliomyelitis patients. The most frequent signs and symptoms are reviewed and methods of evaluation are suggested according to the experience resulting from observations made in the Southwestern Poliomyelitis Respiratory and Rehabilitation Center on more than 1500 patients with poliomyelitis.

The invasion of the central nervous system by the viruses of poliomyelitis has direct and indirect effects upon the other systems of the organism. These may produce multiple clinical syndromes at different stages of the chronic phase of the disease.

The purpose of this communication is to present a systematic classification of the chronic sequelae of poliomyelitis indicating their relative incidence. This classification is based largely on our experience with 1,800 patients admitted to the Southwestern Poliomyelitis Respiratory and Rehabilitation Center, Houston, Texas, and on data provided by the literature.

General Considerations

Table 1 presents a list of body systems of the chronic complications of poliomyelitis and indicates their relative incidence in the three major anatomic forms of the disease. Such a separation of anatomic forms is somewhat fictitious for in the majority of instances the invasion of the central nervous system is widespread. For didactic purposes, however, it is pertinent to indicate that some of the sequelae are related to the extension of the lesion. The sequelae that are apt to occur in bulbo-spinal poliomyelitis patients are those ascribed to the bulbar and high spinal forms.

Muscular Complications

The syndrome of "*spasms*" is prominent early in the post-acute stage of the illness and may last for a period of two to three weeks. Several pathophysiologic factors lead to this syndrome. The catabolic activity and gradual *atrophy* of the paralyzed muscles may cause a myossitic reaction with constant irritation of the pain receptors. In some individuals there is a clear correlation between the syndrome of "muscular pain" and low oscillometric indices in the extremities, thus indicating that an extensive arteriolar spasm plays an important pathogenetic role. Excessive or injudicious exercising of the affected areas is sometimes contributory.

Osteoarticular Complications

The *deformities* of the extremities and the trunk have been the most readily recognized complications of paralytic poliomyelitis. Their progress is insidious but before they become apparent the immobilization and other factors indicated above lead toward fibrosis and ankylosis of the joints and finally result in bizzare deformities.

The high spinal forms with asymmetric or extensive paralysis of the muscles of the trunk are potential causes of *scoliosis*, especially in children and young adults before they complete their statural growth. Scoliosis results not only from

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imbalance of the spine when the patient is in an upright position, but also from the constant unilateral preponderance of the paravertebral muscles, as well as from abnormal and asymmetric distribution of the respiratory gases in the lungs.

In patients presenting respiratory muscle paralysis, a deformity of the anterior part of the thorax frequently is observed (fig. 1). It may be of different shapes depending on the distribution of the paralysis in the respiratory muscles. It may be produced also by the mechanical effect of respirators. The cuirass respirator usually causes a typical deformity consisting of a marked decrease in the anteroposterior diameter in the upper part of the thorax and an increase in the anteroposterior and transverse diameters in the lower part of the thorax thus giving a "barrel chest" appearance. An important pathophysiologic consequence of these deformities is that they prevent efficient expansion of the lungs thereby aggravating the respiratory insufficiency originated by the paralysis.

It has been described that patients kept in the supine position for long periods of time may show an *erosion of the posterior part of the ribs* due to the pressure of the scapulae.

Deformities in bulbar poliomyelitis may result also from involvement of the cranial nerves. The paralysis of the motor branch of the fifth nerve results in *mandibular deformities* of orthodontic implications. It may cause a permanent subluxation of the temporo-mandibular joint and *dental malocclusion*. Under these conditions the voice may show a change of tone, especially if there is paralysis of the muscles of the soft palate and of the vocal cords.

Fig. 1 — Thoracic deformity produced by a cuirass chest respirator.

Respiratory Complications

The syndrome of *respiratory insufficiency* is one of the main obstacles to the rehabilitation of the severely involved patient. To a certain extent this is similar to the high altitude syndrome. Its pathophysiology in poliomyelitis is of great complexity (fig. 2). Although the initial factor is respiratory muscle paralysis or involvement of the respiratory centers there is a constant interaction of multiple factors. These include deformities of the thorax and alterations of dynamics of the pulmonary circulation. In the last analysis, *respiratory failure* results from an imbalance between the physiologic respiratory reserve of the individual and the demands imposed upon him by his physical and respiratory activities.

Individuals with residual damage of the higher centers may show alterations of the regulatory mechanisms of respiration. Respiratory *arrhythmias* are manifested as one of several types of periodic breathing. This is especially apparent during periods of sleep. It is more frequent in children during the convalescent phase and gradually it disappears until the normal respiratory rhythm is resumed.

Respiratory infections are frequent and severe in patients with respiratory muscle paralysis but they may represent a serious problem in the low spinal forms also. Even if respiratory muscle paralysis is not present the weakness of the abdominal muscles prevents effective cough and proper clearing of the respiratory passageways. These infections are also frequent in individuals who suffered involvement of bulbar centers regardless of intact respiratory muscle function. In these individuals the infections arise from the presence of a tracheostomy or from the tendency to *aspirate foreign bodies*.

Cardiovascular Complications

Several complications of peripheral vascular origin often hinder the rehabilitation of spinal poliomyelitis patients. In some individuals the involvement of the lateral sympathetic chain may be manifested by muscle "cramps" which are the cause of intensive pain especially at night. *Arteriolospasm* is the main cause of this disorder which can be easily diagnosed in the presence of low oscillometric indices in the affected areas.

Impairment of the venous return due to paralysis may determine *edema* in the distal parts of all the extremities. It usually disappears when the legs or arms are kept in an elevated position but in some cases it persists regardless of posture. This complication is more frequent in women and generally appears years after the onset.

Cardiodynamic disturbances usually are overlooked as the cause of severe complications in the chronic stage of the illness. Abnormal situations leading to cardiac embarrassment include: 1. residual damage of the autonomic centers; 2. decreased venous return because of prolonged use of artificial respiration and pooling of blood in the paralyzed extremities; 3. hypoxia secondary to respiratory insufficiency; and 4. possibly residual damage produced by the direct invasion of the myocardium by the virus of poliomyelitis. *Cor pulmonale* and *cardiac insufficiency* are the two major conditions to be considered here (fig. 3). Some patients show very poor tolerance to rehabilitation technics and to attempts of weaning them from artificial respiratory assistance. One may be misled by the absence of auscultatory or radiologic signs of cardiac insufficiency. However, careful observation of the patient shows great lability of pulse and blood pressure especially on changing position. The electrocardiogram and phonocardiogram usually reveal severe disturbances of cardiodynamics.

Vasomotor lability is likewise observed in individuals who had involvement of the vasomotor centers. It may be manifested by sudden vasoconstriction or vasodilation of the skin and by tendencies to orthostatic hypotension, paroxysmal tachycardia or bradycardia.

Hypertension is observed often in individuals several years after the acute stage. Renal insufficiency and hyperfunction of the adrenal glands as a result

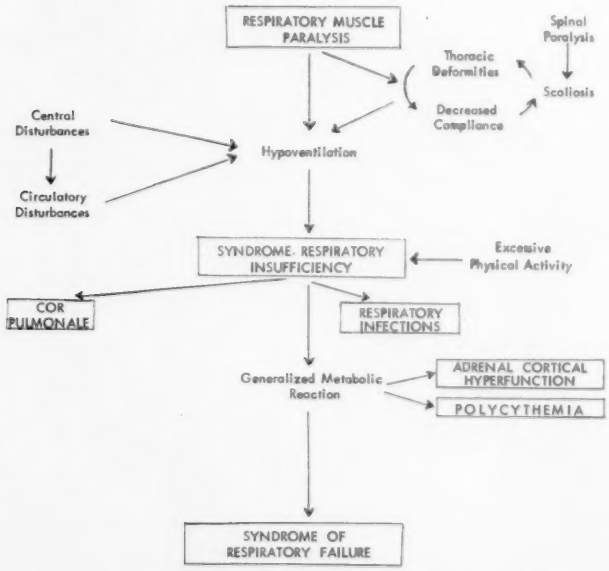

Fig. 2 — The respiratory syndrome of chronic poliomyelitis.

of the continuous stress imposed by high energy requirements are among the main causes. At times hypertension is due exclusively to a central involvement and in this case it may be transient and disappear in a few weeks after the onset of the acute illness.

Urinary Complications

During the acute stage of the illness catheterization usually is required to prevent retention of urine. Although patients recover their ability to void spontaneously severe urinary complications of the chronic stage may be related to the initial catheterization (fig. 4). Chronic *cystitis,* urethritis and prostatitis are common. *Urinary bladder lithiasis* may occur as a complication of chronic hypertrophic cystitis with stenosis of the bladder neck.

A more severe complication is *renal*

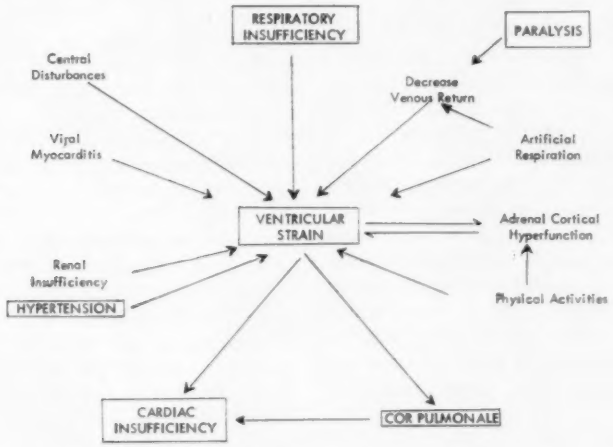

Fig. 3 — The cardiovascular syndrome of chronic poliomyelitis.

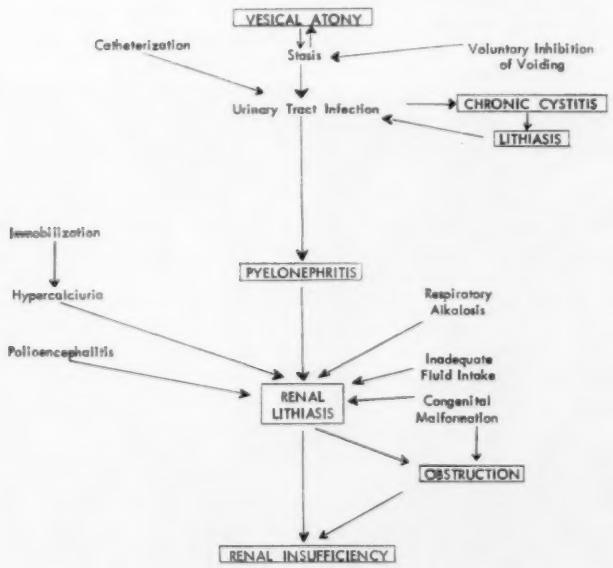

Fig. 4 — The urinary syndrome of chronic poliomyelitis.

lithiasis. Serial urologic examinations in paralyzed patients have permitted us to detect calculi in the renal pelvis and calyces eight weeks after onset. Most often they become apparent at a later stage but on exception, beyond three years from onset of the illness. There is no apparent correlation between the extension of paralysis and the presence of kidney stones. Undoubtedly other factors must be taken into consideration. In all patients who have presented renal lithiasis we have observed the coincidence of two or more of the following pathologic circumstances: 1. chronic infection of the urinary tract (almost always due to the initial catheterization); 2. immobilization; 3. osteoporosis; 4. marked respiratory alkalosis due to hyperventilation produced by artificial respiration; 5. congenital malformations of the urinary tract; 6. history of an acute phase with a severe component of polioencephalitis; and 7. insufficient liquid intake. Repeated crisis of *urinary tract obstruction* and *chronic pyelonephritis* lead to severe impairment of renal function and ultimately may cause *renal failure* and death.

Metabolic and Endocrine Disorders

It is known that prolonged immobilization of an extremity or of the whole body produces muscular atrophy and demineralization of the bones. When the immobilization is due to paralysis both processes are of greater magnitude than when the immobilization is not due to neuromuscular deficit. However, the complex metabolic syndrome of the convalescent and chronic stages of poliomyelitis is not caused solely by immobilization. Metabolic changes occur also in pure bulbar forms or in bulbo-spinal poliomyelitis with slight involvement of the peripheral musculature.

The generalized *osteoporosis* present in the high spinal forms is usually related to the degree of paralysis. It is frequent at all ages but more common in older patients.

Every poliomyelitis patient has a period of transient *hypercalciuria* which usually attains its peak between the second and sixth week of the convalescence. In part, hypercalciuria reflects the presence of a generalized osteoporosis but other factors such as changes in pH of the blood, functional disorders of the hypothalamic areas (with repercussion on the function of the parathyroids and the adrenal glands) are contributory.

A syndrome of *adrenal cortical hyperfunction* may be easily identified in severely involved patients. It is apt to occur in all ages and in both sexes and is probably a manifestation of a reaction of alarm to the stresses to which the poliomyelitic may be subjected. Its pathogenesis is extremely complicated (fig. 5). It frequently is observed in individuals with slight respiratory insufficiency who submit themselves to excessive physical activities. It is manifested by clinical signs which at times are easily overlooked. We attribute great significance to the presence of seborrhea and acne or an abnormal distribution of the subcutaneous tissue in the face and neck giving a typical moon face appearance. These external changes may be accompanied by tachycardia, increased diastolic blood pressure, polycythemia, and definite changes in the cardiac dynamics (such as changes in the vector of T and a shortening of the mechanical systole). We have found in these patients high levels of 17-hydroxycorticosteroids in plasma and high daily urinary outputs of these corticoids. In a few instances we have observed alterations in the sodium-potassium ratio of the urine (indication of hyperaldosteronism).

This syndrome of adrenal hyperfunction presents a special form in the adolescent. It has been recognized and referred to as the *immobilization syndrome of the adolescence.* The imbalance between the hypermetabolic activity of this age and chronic hypoventilation may be the leading cause of this disorder. The external appearance of the patient is characterized by the stigmata that we have indicated already. The cushionoid appearance of the face is very striking (fig. 6) and their seborrhea and acne are in excess to what is usually observed at this age.

The presence of extensive paralysis is of no consequence for the sexual potency

of the poliomyelitis patient. There is no evidence of changes in fertility as a result of this disease. Pregnancy occurs very frequently in chronic poliomyelitic women in spite of extensive muscular involvement and constant use of artificial respiration. It is impossible to ascertain if the hormonal changes which we have described in the adolescents impair their fertility. Very likely this will not be the case but we have had little experience with individuals who have had extensive paralysis in the pre-adolescence and who subsequently married. In poliomyelitis women it is frequent to observe *amenorrhea* for a long time after the acute stage of the illness. At times it lasts for as long as one or two years. It is a manifestation of the complicated endocrine change that follows the initial impact of the disease.

Gastrointestinal Disturbances

Residual paralysis of the abdominal muscles, prolonged immobilization and impairment of function of the intrinsic intestinal innervation are factors that cause the chronic *constipation* and the frequent *fecal impactions* of the poliomyelitic.

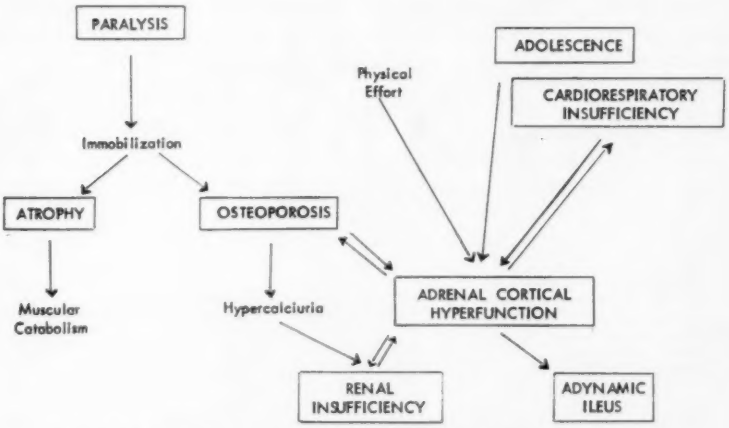

Fig. 5 — The metabolic and endocrine syndrome of chronic poliomyelitis.

Fig. 6 — Moon face appearance of an adolescent with chronic poliomyelitis.

Adynamic ileus is a manifestation of the general metabolic syndromes that we have outlined above. It may be the first indication of adrenal cortical hyperfunction especially if low levels of serum potassium are present. Sometimes this complication is related to an episode of renal infection or renal lithiasis.

Residual *deficits of swallowing* function are present in bulbar poliomyelitis patients. Among 237 patients who had initial loss of deglutitory function only two failed to recover ability to ingest solids and liquids. This low incidence does not necessarily indicate that total recovery of the swallowing mechanism is the rule. In the majority of instances a permanent deficit can be demonstrated by fluoroscopy of the patient during swallowing of contrast media.

Cutaneous Disorders

Lack of mobilization and inadequate hygiene of the skin will eventually produce extensive *bedsores* in the severely paralyzed person. *Paronychias* and *trophic ungual disturbances* are also the result of poor hygiene of the nails.

Seborrhea and *acne* may be of great significance as manifestations of stress.

Disturbances of Special Senses

Audiometric tests of individuals who have suffered bulbar poliomyelitis have

Table 1: Chronic Sequelae of Poliomyelitis

Sequelae Types	Form of Poliomyelitis: Low Spinal	High Spinal	Bulbar and Polioencephalitic
Muscular			
"Spasms"	+++	+++	+
Atrophy	++	+++	+
Osteoarticular and Dental			
Deformities	++	+++	+
Ankylosis	++	+++	
Scoliosis		+++	
Temporo-Mandibular Subluxation			+++
Dental Malocclusion			+++
Respiratory			
Respiratory Insufficiency	+	+++	+
Pneumonia-Atelectasis		+++	++
Respiratory Arrhythmia			++
Aspiration Foreign Bodies			++
Cardiovascular			
Cor Pulmonale	+	+++	+
Cardiac Insufficiency		+++	+
Hypertension	++	++	++
Vasomotor Lability	+	+	+++
Arteriolar Constriction	+	++	+
Phlebothrombosis	+	++	+
Urinary			
Bladder Atony	+	+	
Cystitis	+	++	+
Bladder Lithiasis	+	++	
Pyelonephritis		+++	+
Renal Lithiasis		+++	+
Metabolic and Endocrine			
Osteoporosis	++	+++	+
Hypercalciuria		++	+
Adrenocortical Hyperfunction	+	++	+
Immobilization Syndrome of the Adolescent		++	
Amenorrhea	++	+++	+
Gastrointestinal			
Constipation	+++	+++	+
Adynamic Ileus	+	++	
Swallowing Difficulties			++
Cutaneous			
Decubiti Ulcers	+	++	
Ungual Disturbances	++	+++	
Seborrhea-Acne	+	++	+
Special Senses			
Acoustic Deficit		+	++
Equilibrium Loss			+
Psychic			
Emotional Lability		++	++
Behavior Disorders		+	++
Depression	+	+++	+
Infantile Regression		++	

indicated that *hearing deficits* are more frequent than commonly believed. They result from initial involvement of the centers of audition.

Some of our bulbo-spinal patients have shown signs of slight *loss of equilibrium* and tendency of vertigo. Very likely these are manifestations of residual vestibular damage.

Psychic Disturbances

The impairment of physiologic behavior which is of great magnitude in the severely paralyzed patients has psychologic and sociologic repercussions. Fortunately, poliomyelitis, even in the bulbar and polioencephalitic forms, almost never determines intellectual deficit. We have seen only one child whose mental retardation could be directly (viral invasion) or indirectly (cerebral anoxia) related to poliomyelitis. This conservation of mental faculties helps the patient a great deal in his adaptation to disability. However, in some individuals psychologic reaction to disability is out of proportion. Severe *depression, withdrawal reaction,* and *infantile regression* are the most common forms of psychologic disturbances that can be observed. *Behavior disorders* are common but transient in children who have had bulbar or encephalitic involvement.

Conclusion

A severe derangement of physiologic behavior in chronic poliomyelitis patients may be manifested by several typical syndromes. Some of these syndromes are the cause of early death in many patients. In others the depletion of physiologic reserves appears to lead to premature aging of some physiologic systems. Special emphasis ought to be given to the avoidance of injudicious scheduling of physical activities and treatments in individuals with residual paralysis of the respiratory muscles.

An early diagnosis of these sequelae and the establishment of their immediate treatment are possible only by means of periodical examinations of the poliomyelitis patients.

Information relative to securing reprints of this study may be had by checking the Reader Service column on page iv of this issue.

Genius is but the fruit of labor and thought.

— ALEXANDER HAMILTON

Diagnosis of Hysterical Paralysis

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● The diagnosis of psychogenic paralysis is not difficult if the examiner is familiar with the bizarre response to tests displayed by this type of patient. A working classification of the etiologies of muscle weaknesses, apparent and real, are listed. The causes of abnormal gait patterns are presented. A list of clues is offered to help clarify the differential diagnosis. How electrodiagnostic tests provide helpful information is explained. A 16 mm. color film provides a pictorial study of salient points covered in the paper.

Hysteria was originally thought to be a group of symptoms present only in females as a result of a wandering uterus. Charcot,[1] a century ago, demonstrated it in males and also in children. Later Babinski revised the teachings of Charcot, but his original description of the hysterical paralysis remains classic.

The purpose of this paper is to emphasize clinical signs which aid in recognition of hysterical weakness.[2-4] No attempt is made to differentiate weakness resulting from conscious versus unconscious causes. Both types show strikingly similar findings and in both, the pattern of weakness may appear in any form or degree.

It is the common practice to make the diagnosis of psychogenic weakness by excluding all possible organic causes. There are five signs which we believe are characteristic of hysterical weakness, any of which may appear during a careful physical examination. These signs permit a positive approach to the diagnosis.

1. *Cogwheel Response.* The cogwheel or ratchet response is seen on the manual muscle test. This is a jerky relaxation of the muscles being tested, and is almost pathognomonic of hysterical weakness. The opposite response is seen in patients with weakness due to neuromuscular pathology because they will exert maximum effort throughout the test; thus the weak muscles, in effect, "give away" smoothly. A technic to reinforce the cogwheel response is to repeat the test, increasing the force suddenly, whereupon the patient holds forcibly, a second or so, then gives away.

2. *Inconsistencies.* Inconsistencies become apparent during the examination of the neuromuscular system. For example, when testing "weak" elbow flexors the patient resists five to ten pounds of force for a few seconds and then gives way. When repeating the test with considerably less force, the hysterical patient gives way with equal ease. Repeating the test several times with the same force will result in different responses by the patient. An objective record is more easily obtained by using a measuring device such as a spring scale or a strain gauge.

Muscles which are apparently flaccid may suddenly contract when the patient performs functional acts. Examples include: crawling backwards stimulates contraction of the hamstrings; coughing stimulates the latissimus dorsi;[7] a painful stimulus may cause a paralyzed limb to withdraw; the foot groups may test extremely weak on the examination table but resist the patient's body weight when later he is asked to walk on his toes or heels; or he may hold the foot rigid during the swing phase of his gait. This inconsistency is seen in the hamstrings and quads when the patient squats and rises slowly in spite of a flaccid extremity when recumbent.

Although less specific, other inconsistencies include weakness beyond all expectations in the absence of atrophy or reflex changes; when with the patient recumbent, he is asked to raise the "paretic" lower extremity, there is no pressure under the sound heel;[8] and

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when he is asked to raise the sound leg there is associated heel pressure on the "paretic" heel.

3. *Bizarre Gait.* The gait is bizarre when the lower extremities are involved. A knowledge of functional anatomy and pathologic gaits facilitates its recognition. Pathologic gaits result from the following causes of muscle weakness:

1. Motor unit disease and injury.
2. Upper motor neuron conditions.
3. Bone and joint abnormalities.
4. Pain.

Each category is identified by specific gait patterns that are consistent with the pathology. The hysterical patient may simulate any one or more of these patterns, but the bizarreness suggests the hysterical component.

4. *Slowness of Motion.* During the examination the patient performs many of the activities in a slow and laborious manner. It frequently appears as if all activity is taking place in slow motion. Many of the functional tests (e.g. squat and rise) require considerably more strength when done slowly.

5. *Overflow of Activity.* The hysterical patient frequently performs simple acts with an overflow of activity into unrelated areas. Frequently the trunk will wobble and the arms elevate and wave while the patient is walking on his heels or toes. Overflow of activity also may be present during the manual muscle test.

Comment

The presence of any of the above signs should alert the physician to the possibility of hysterical weakness. Although it is possible for minimal organic pathology to be present, this should not prevent recognition of the hysterical component, which may be the major disabling condition.

Laboratory Aids

Motor unit disease or injury is probably most often confused with hysterical weakness. This can be identified and localized with electromyographic and nerve muscle stimulation studies.[9, 10]

Summary

The diagnosis of hysterical weakness is less difficult if the examiner becomes familiar with the bizarre response of the patient to the tests described. A working knowledge of functional anatomy and muscle testing is a requisite for evaluating weakness.

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Information relative to securing reprints of this study may be had by checking the Reader Service column on page iv of this issue.

Modified Shoulder Saddle Harness for Upper Extremity Prostheses

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● It has often been stated that the figure 8 is the harness of choice for upper extremity amputees. However, in Michigan where our adult amputee population largely is composed of farmers and industrial workers, a modified shoulder saddle has come to be the harness of choice. In the past year and a half the amputee clinic at the University of Michigan has prescribed prostheses for 28 upper extremity amputees (10 above and 18 below the elbow). Nineteen of these received the new shoulder saddle type of harness. Previous to this period most of our amputees had received the figure 8 harness. Several of our amputees have been provided with both the figure 8 and a new shoulder saddle harness. All of them preferred the shoulder saddle. In comparison with the standard figure 8 harness, the new shoulder saddle provides a larger weight-bearing area, more comfort while doing heavy work, the potential to lift heavy objects and no pull under the axilla on the normal side. It provides considerable improvement over the old type of shoulder saddle which used leather suspension loops running through D rings on the prosthesis. The new Bowden cable suspension permits much freer motion at the shoulder and obviates the former difficulty of the harness slipping around the chest due to the lack of free motion between the leather suspension straps and the D rings.

Many improvements in upper extremity prostheses have resulted from the efforts of interested individuals over the past 15 years. Before World War II, prostheses had been undergoing a slow metamorphosis but few important changes were made during the first third of the twentieth century. Leather thongs and catgut cords usually were employed for suspension of prostheses and control of terminal devices. Harness designs varied somewhat, but, for the most part they resembled the figure 8 currently used.[1, 2]

It is the opinion of several authors[3-5] that the figure 8 is the harness of choice for either below elbow or above elbow amputees. Anderson[5] states that a chest strap with a leather or fabric shoulder saddle harness has the advantage of permitting the amputee to lift greater axial loads with more comfort than the figure 8 allows. Several of the amputees, whom we have fitted with figure 8 harnesses, have complained of pressure and irritation in the axilla on the normal side. In an effort to overcome this discomfort, we tried several leather shoulder saddle type harnesses with chest straps. However, because of the friction between the leather support straps and the D rings through which the straps run, there was a great loss of efficiency. Therefore, we sought a better means of suspension.

First, the leather suspension straps were changed to dacron (vinyon) tape which provided some increase in efficiency. The prosthetist then designed an even more satisfactory suspension system. For above elbow prostheses, it consists of a leather shoulder saddle held to the patient's body by a chest strap of cotton webbing and a Bowden cable attached to the anterior and posterior aspects of the socket of the prosthesis. The housing of the cable is held in a hoop over the shoulder saddle by means of two cable housing retainers, one at the delto-pectoral groove and the other over the spine of the scapula; these are both attached to the leather shoulder saddle (fig. 1). This harness can be modified for a below elbow prosthesis by attaching the ends of the Bowden cable suspension system, for convenience called the inverted Bowden cable, to the Y strap anteriorly and to the triceps pad posteriorly (fig. 2). In this manner the prosthesis is supported through a stable suspension system with minimal friction and considerable freedom of motion. This suspension system is not designed to provide any means of control for the terminal device. A second separate Bowden cable is attached to the chest strap at the point where the chest strap crosses the amputee's vertebral column and runs along the prosthesis to the terminal device. The point of attachment to the chest strap may vary several inches in either direction. Adjustments in this

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This saddle harness was designed and fabricated by Dominic Lemma of the Wright and Filippis Artificial Limb Company, Detroit.

Read at the 3rd International Congress of Physical Medicine, Session on Orthetics and Prosthetics, Washington, D. C., August 26, 1960.

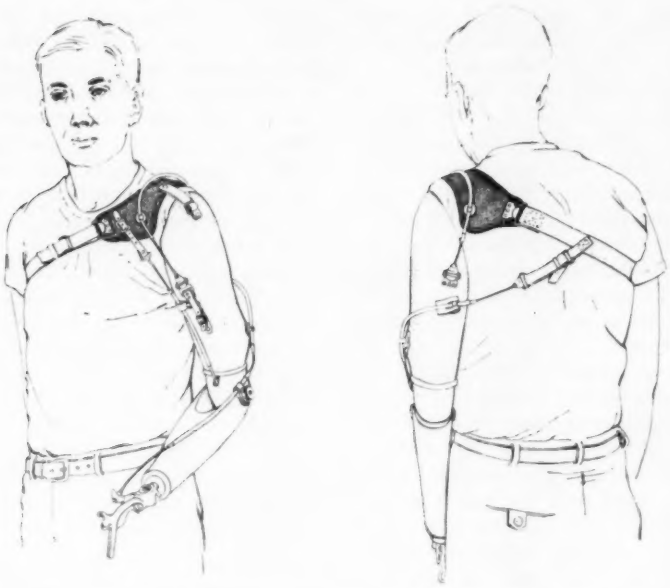

Fig. 1 — A modified shoulder saddle harness used with an above elbow prosthesis.

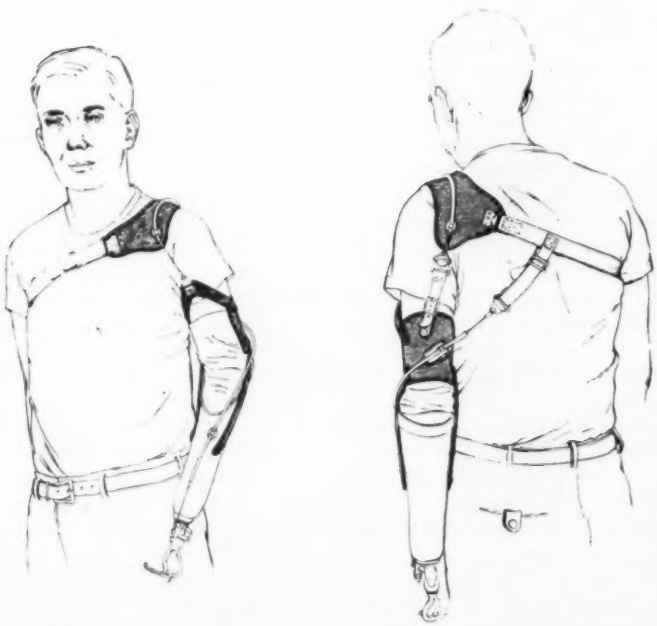

Fig. 2 — A modified shoulder saddle harness used with a below elbow prosthesis.

attachment are made until the point which provides maximal efficiency in the use of the prosthesis is determined.

This modified shoulder saddle harness was first used in our clinic in March, 1958. Since that time we have prescribed this type of harness for 21 amputees; 13 of these amputees were below elbow. During the same period we prescribed only eight figure 8 harnesses for two above elbow and six below elbow amputees; we would have preferred a modified shoulder saddle for the majority of these eight amputees. However, of the six below elbow amputees, three had previously used a figure 8 harness and did not wish to change, one was a young woman, one was an office worker who did not want the bulge of the shoulder saddle under his shirt, and one was a student who preferred the minimal amount of harnessing. Of the two above elbow amputees provided with a figure 8 harness, one was a previous wearer of the figure 8 and the other had a paralyzed shoulder from a brachial plexus injury, so he planned to use the prosthesis only for cosmesis.

Four of the 29 amputees seen between March, 1958 and September, 1959, were provided with both a figure 8 and a modified shoulder saddle harness. All four of these men preferred the modified shoulder saddle because of greater comfort and increased function.

For purposes of comparison we reviewed the prescriptions for the 26 upper extremity amputees who had received new prostheses through our amputee clinic during the 18 month period prior to March, 1958. Twenty-two of these amputees (12 above elbow, and 10 below elbow), received figure 8 harnesses, and only four (one above elbow and three below elbow), received shoulder saddles of the old type.

It has been stated that above elbow amputees rarely engage in heavy work.[5] In our experience, this is not the case. Our amputees are engaged in such occupations as truck driver, farmer, day laborer, factory worker, junk yard operator, mason, sanitary engineer, custodian, and carpentry instructor. Undoubtedly, this influences our frequent use of the modified shoulder saddle harness.

Some disadvantages of the old type of chest strap harness are the difficulty in application and removal and the tendency of the harness to rotate about the chest. Our patients have not experienced these difficulties with the modified shoulder saddle. Ease of application has been achieved by use of new type fasteners at the ends of the chest strap. The chest strap is completely detachable from the shoulder saddle so that it can be washed. Since the leather shoulder saddle usually outlasts the webbing chest strap, we provide each amputee with two chest straps but only one shoulder saddle. The lack of stability of the chest strap harness with shoulder saddle, and its tendency to rotate about the chest has in large part been rectified by the use of the inverted Bowden cable in place of the leather suspension loops and D rings.

There are several distinct advantages to the modified shoulder saddle when compared to the figure 8. The shoulder saddle provides a larger weight-bearing area and thus permits the lifting of heavy axial loads with comfort. The chest strap portion also distributes the load over a larger body surface area and removes all the pull from the sound axilla. Our amputees have found that whether or not they must do heavy lifting, the modified shoulder saddle is a very comfortable harness which permits a free range of motion and ease of operation of the prosthesis.

It is readily apparent that we have come to regard the modified shoulder saddle harness as the harness of choice in adults. It may well be that our choice has been influenced by the composition of our amputee population in Southeastern Michigan. Half of our adult amputees are farmers or industrial workers. We have succeeded in returning more than 90 per cent of these patients to the occupation they were engaged in before their amputation. Three of them, obviously prevented from engaging in their former occupation, have been retained by their employers in other jobs; two have been unable to find suitable employment. Five amputees, who had not been able to find or to retain jobs before they obtained their prostheses, are now employed.

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Information relative to securing reprints of this study may be had by checking the Reader Service column on page iv of this issue.

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editorial

New Name Needed

As one who has specialized in what is now known as the field of Physical Medicine and Rehabilitation for over twenty-two years, I am still dissatisfied with its name. The change from Physical Therapy Physician to a Doctor who specializes in Physical Medicine was a good one. The term coined to describe this individual, "Physiatrist" has become generally accepted, but we did not change the name of the field at the same time.

"Rehabilitation" was added as a compromise to bring a growing group of Physicians into our fold and because some thought and still do, that it better describes our activities and interests; The American Board adopted the term, also the A.M.A. Council and Section; The Congress, Academy, many local societies, hospital departments and university training programs.

Within a short time resentment of our specialty's sole use of the popular term Rehabilitation built up in other specialty groups. We lost the A.M.A. Council of Physical Medicine and Rehabilitation and the Section, as is well known.

What are we to do to have a name which is all our own and which is appropriate?

I propose that inasmuch as the term physiatrist (pronounced fiz e-at' rist) has become accepted and meaningful, that we use the name PHYSIATRICS to describe our special field.

I would like to see the American Board and the A.M.A. Section use this terminology. Also the *Archives*. In time I think university and hospital departments would adopt it. The various societies might like to retain their present name because of tradition.

I think the universal use of the name "PHYSIATRICS" would help to unify the specialty, reduce jealousies of other specialties and give us a name which is all our own and one of which to be proud.

— Arthur L. Watkins, M.D.

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survey of selected literature

This systematic abstracting and indexing of selected journals is made possible by a grant from the American Rehabilitation Foundation, a subsidiary of the Kenny Rehabilitation Institute.

ACTA PHYSIOLOGICA SCANDINAVICA. *Vol. 50 (Part 1) 1960.*

◇ **The Effect of Blood Volume Variations on the Pulse Rate in Supine and Upright Positions and During Exercise. B. Gullbring; A. Holmgren; T. Sjostrand, and T. Strandell. pp. 62-71.**

The effect of bleeding of about 10 per cent of the blood volume and reinfusion of this quantity of blood seven days later was studied in six male subjects. The study includes determination of the pulse rate at rest in supine and upright positions and during exercise on a bicycle ergometer. The physical working capacity (PWC_{170}) was computed from the pulse rates during work. The pulse rate in upright position and during exercise increases and PWC_{170} decreases immediately after the bleeding. During the next few days PWC_{170} increases and the pulse rate in upright position and during exercise decreases, while the pulse rate in supine position appeared to increase. On the sixth day PWC_{170} was found to be higher and the pulse rate in supine and upright positions and during exercise to be lower than before the bleeding. Reinfusion of the blood seemed to produce a further moderate increase in PWC_{170}. The decrease in PWC_{170} after the bleeding corresponded, on the whole, to the average relation in different individuals between PWC_{170} and the total amount of hemoglobin. The respiratory rate during exercise increased after the bleeding and also showed the same tendency as the pulse rate did during exercise and in upright position during the next few days.

◇ **Effect of Training on Work Capacity, Total Hemoglobin, Blood Volume, Heart Volume and Pulse Rate in Recumbent and Upright Positions. A. Holmgren; F. Mossfeldt; T. Sjostrand, and G. Strom. pp. 72-83.**

The effect of training, either with gymnastic exercise and running once or twice a week for several months, or with daily skiing in mountainous terrain for eight to 10 days, has been studied on a total of 87 test subjects. Determinations were made of work capacity, expressed as work on a bicycle ergometer at a pulse rate of 170 and at relative steady state ($PWC_{170}s$), total amount of hemoglobin (THb) and blood volume, heart volume in recumbent position, and pulse rate at rest in recumbent and upright positions. The intermittent long-term training was found to cause an increase in PWC_{170}, THb and blood volume, and a decrease in pulse rate in recumbent position. The heart volume showed an insignificant average increase in two subject groups, and decreased slightly in a group of middle-aged men. The relation between $PWC_{170}s$ and THb or blood volume corresponded, both before and after the training, to the relationship earlier demonstrated in a series of individuals differing with respect to age, body size, sex and degree of physical training. The continuous short-term training was also found to induce an average increase in the $PWC_{170}s$, blood volume and THb, and a decrease in the pulse rate in recumbent and upright positions. This type of training increased the $PWC_{170}s$ more in relation to the THb and blood volume than did intermittent long-term training. Some individuals showed no increase in THb. On the average these subjects showed a smaller increase in $PWC_{170}s$ and a smaller decrease in the pulse rate in recumbent and upright positions than the individuals presenting an increase in THb. The effect of such ski training on $PWC_{170}s$ and THb seems to be dependent upon the intensity rather than the daily duration of the training. Observations were made on eight of the test subjects during a period of almost two years during which the intensity of the training was varied. The $PWC_{170}s$ showed appreciable variation which was almost paralleled by the blood volume variation. The pulse rate in recumbent position varied inversely with the $PWC_{170}s$. The results of the investigation indicate the existence of a direct relationship between work capacity and blood volume (total hemoglobin) under normal conditions.

Electrophysiological studies on gamma motoneurones. *Eccles, J. C.; R. M. Eccles; A. Iggo, and A. Lundberg. p. 32.*

Functional localization as an aid to implantation of permanent electrodes into the hypothalamus of horned goats. *Andersson, B.; N. Persson, and L. Strom. p. 49.*

Poststimulatory electrical activity in the preoptic "heat loss centre" concomitant with persistent thermoregulatory response. *Andersson, B.; N. Persson, and L. Strom. p. 54.*

Oxygen intake and thermal balance in naked young men during rest and sleep at various ambient temperatures. *Lange Andersen, K., and B. Hellstrom. p. 88.*

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ACTA PHYSIOLOGICA SCANDINAVICA. *Vol. 49 (Part 4) 1960.*

◇ **Circulatory Data in Normal Subjects at Rest and During Exercise in Recumbent Position, with Special Reference to the Stroke Volume at Different Work Intensities. A. Holmgren; B. Jonsson, and T. Sjostrand. pp. 343-363.**

Right heart catheterization has been performed in 18 healthy subjects, 14 males and four females, including estimation of cardiovascular pressures and cardiac output at rest and during different intensities of exercise in recumbent position. During exercise the cardiac output increased linearly with the oxygen uptake. The increase of the arteriovenous oxygen difference in relation to the work load or the pulse rate was higher in the males than in the females. With change from rest to work the stroke volume increased slightly but significantly in the males. By increasing work load it successively decreased to the size at rest. There was a high correlation between the stroke volume on one hand and the work performed at pulse rate 170, the heart volume, and the blood volumes on the other. The mean pressure in the pulmonary artery was 5 mm. Hg higher during exercise than at rest but was constant at different work loads. The end-diastolic pressure in the right ventricle and the mean pulmonary venous pressure (PCV-pressure) did not change significantly with the increase in pulse rate.

◇ **On the Postnatal Development of Postural Mechanisms as Revealed by Electromyography and Myography in Decerebrate Kittens. S. Skoglund. pp. 299-317.**

The postnatal development of some postural mechanisms in kittens from birth to 45 days of age has been studied. The ability of the animals to walk and stand has been correlated with their reactions to different types of decerebration and ablation of the anterior lobe of the cerebellum. It was shown that intercollicular decerebration does not induce any extensor hypertonus until around a fortnight after birth when it first appears in the forelimbs. Later, after three weeks, it appears in the hindlimbs. It disappears on deafferentation and is a gamma rigidity. Ablation of the anterior lobe of the cerebellum subsequent to intercollicular decerebration induces a strong decerebrate rigidity with signs of opisthotonus regardless of the age of the kitten. It persists after deafferentation and is an alpha rigidity. It is concluded that the cerebellum exerts a tonic inhibitory influence on the vestibular nuclei already in the newborn kitten. Ablation of the anterior lobe of the cerebellum removes this inhibition and alters the flexor-extensor balance in the spinal cord. The missing gamma rigidity in the newborn animal is readily explained by the observation that no tonic stretch reflexes, as revealed by electromyography can be obtained from the muscles concerned with decerebrate rigidity. The tonic stretch reflex develops in a proximo-distal direction in the limbs as revealed by electromyography and is earlier obtained in the alpha than in the gamma animal and earlier in the forelimbs than in the hindlimbs. This development thus precedes the gamma rigidity which in its development closely follows that of the animal's ability to use its limbs for walking and standing. It also runs in a cranio-caudal direction.

The spinal transmission of proprioceptive reflexes and the postnatal development of conduction velocity in different hindlimb nerves in the kitten. *Skoglund, S. p. 318.*

Zinc-induced relaxation of muscle fibers. *Edman, K. A. P. p. 330.*

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AMERICAN JOURNAL OF THE MEDICAL SCIENCES. *Vol. 240, July 1960.*

◇ **The Blood Donor: I. Who Are Our Blood Donors? An Analysis of Social and Other Characteristics of 12,759 Donors. F. F. Korzekwa; W. Q. Jordan, and J. B. Alsever. pp. 36-47.**

This is a study of a statistical sample of blood donors cooperating with a blood bank operation involving eight southwestern states. More than 12,000 donors were studied during five selected one-week periods during 1958. All donors accepted at these times were questioned on a number of points having to do with their history and experience as blood donors and their social and occupational status. The study emphasizes the comparison between paid and replacement donors. Volunteer donors were not studied as this was a commercial enterprise. An interesting finding was that only seven per cent of those studied had first given blood on a volunteer basis

as military personnel or to Red Cross Regional Centers. Seventy-six per cent of those studied were paid donors while 24 per cent were replacement donors for specific patients. There were no occupational groups contributing an unusually high or low fraction of the donors. Almost twice as many paid donors were unemployed at the time of donation as were replacement donors. Nine out of 10 replacement donors were permanent residents while this was true of only seven of 10 paid donors. One of every four replacement donors was giving blood for the first time while only one of every 12 being paid was a first time donor.

Eight out of 10 paid donors had given more than twice previously while this was true of only six of every 10 replacement donors. The authors concluded that in general only a small percentage of the total population are regular, willing and able donors who respond repeatedly to need. The total experience indicates that paid donors constitute a more valuable and reliable donor reservoir. Paid donors proved to be significantly less likely to have positive serologies and to give incomplete (short) donations.

◇ **The Effect of Nylidrin Hydrochloride (Arlidin) on the Cerebral Circulation. S. Eisenberg; with the technical assistance of M. F. Camp and M. R. Horn. pp. 85-92.**

The authors investigated the effects of this drug on cerebral blood flow because previous workers had shown that its oral administration resulted in an increased flow in retinal vessels. Chemically the drug is 1 (p-hydroxyphenyl)-2-(1′ methyl-3′ phenylpropylamino)-propanol, hydrochloride. It is a synthetic epinephrine-like compound which has been used extensively in peripheral vascular disease. Begging the questions of the clinical effectiveness of this agent in the therapy of cerebral vascular disease, and in fact of the desirability of increasing cerebral blood flow in this disease, blood flow to the brain in a number of cerebral vascular patients and in normals was measured before and after administration of this drug. Observations were conducted on two experimental groups: those receiving the drug for less than two weeks (15 subjects) and those treated for more than two weeks (7 subjects). A small equivocal increase in flow was observed in the group treated for less than two weeks, while a highly significant increase averaging 43 per cent was observed in the group treated for the longer period. Concommitantly the cerebral vascular resistance was observed to fall while the arterial pH and pCO_2 were not significantly altered. The authors concluded from this that the effects of the drug were primarily cardiovascular.

Section on progress of medical science — the arteriole in neural lesions. *Holt, G. W. p. 110.*

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AMERICAN JOURNAL OF THE MEDICAL SCIENCES. *Vol. 240, Sept. 1960.*

◇ **The Value of Home Recordings of Blood Pressure in the Management of Patients with Arterial Hypertension. G. E. Burch, and N. DePasquale. pp. 273-279.**

In order to regulate properly the dosage of the new effective antihypertensive drugs it is necessary to make frequent observations of the arterial blood pressure. It is not practical for the physician to take the blood pressure as frequently as is desirable in such management. Further, because of the effect of psychological factors on blood pressure readings, it is important that the blood pressure should be taken in a situation producing as little anxiety as possible. The authors have utilized blood pressure data secured in the home in managing hypertensive patients. They advised patients to secure a sphygmomanometer and stethoscope. They then taught a member of the patient's family to measure the blood pressure. The patients were advised to record their blood pressure at least upon arising, in mid-afternoon and upon retiring. The patient's attendant was taught to regulate drug dosage in accordance with blood pressure readings. Three illustrative case histories are presented. One is for a patient whose blood pressure was always elevated as observed in the physician's office but was normal at home. One is for a patient whose hypertension has been well regulated by correlating drug dosage with home blood pressure observations, and the third is for a patient who was haphazard and uncooperative about taking the blood pressure and in conveying the records to the physician. The authors feel that this technic has many benefits to offer in the management of hypertension in intelligent, cooperative patients.

◇ **Peritoneal Dialysis in Renal Failure. E. A. Cleve; F. P. Smith, and N. M. Hensler. pp. 319-326.**

While the present use of the artificial kidney has proved to be safe and effective in the management of oliguria, its proper use requires a well organized, highly skilled team and extensive laboratory facilities. Peritoneal dialysis while simpler to employ was abandoned for many years because of the dangers attendant to its use. Nevertheless, fairly recent careful use of this method in the management of nephrectomized animals has led to renewed interest in its use for human

patients. The authors present the results of this method of management of nine patients with prolonged oliguria precipitated by various causes. The dialyzing fluid used consisted of a mixture of suitable proportions of the following solutions, all of which are commercially available in sterile condition: 5% glucose in water, 5% glucose in normal saline, normal saline, and 7.5% $NaHCO_3$. The solution has an osmotic activity greater than that of plasma being approximately 400 milliosmoles per liter. Hypocalcemia was controlled by intravenous calcium administration or, in some cases, with the addition of calcium to the dialyzing fluid. Admission to the peritoneal cavity was accomplished with a paracentesis trocar through which a perforated polyethylene catheter was introduced. The catheter was left *in situ* for the entire period of treatment. The quantity of fluid employed per treatment was 3150 ml. and it was left in the cavity for two hours. Uremia and hyperkalemia were well controlled by periodic treatments (usually 2 per 24 hours). Of the nine patients, five had acute reversible renal failure and four had chronic renal disease with oliguria. Two of the patients with acute oliguria recovered, two more survived until the diuretic phase of the disease and the remaining one died during the oliguric phase of the disease from other causes. Of the chronically ill patients, the survival was 18, 24, 30 and 45 days. The authors point out that no difficulty was encountered with sepsis. The technic is recommended where the more elaborate facilities and technically trained staff necessary for using the artificial kidney are not available.

◇ **Air Pollution and Respiratory Disease. A Preliminary Report. F. C. Dohan, and E. W. Taylor. pp. 337-339.**

This paper is a statistical study of personnel health records for a large multiplant industrial corporation. Data was available for the insurance years of 1955, 1957 and 1958 for women working in plants in the following five cities: Harrison, N. J.; Camden, N. J.; Woodbridge, N. J.; Indianapolis, Ind.; and Cincinnati, Ohio. The number of women working in the different plants ranged from 1500 to 3700. Air pollution data was taken from the Public Health Service Publication No. 637 (Air Pollution Measurements of the National Air Sampling Network). Although air pollution data was not available for all the years covered in all of the five cities, the authors justify their inference that the data for a given locality remains quite constant from year to year. They find a very high correlation between the average number of respiratory disease claims per year per female employee and the average sulfate concentration in the air at a given locality. The claim frequency per 1000 employees per year ranged from 18.5 at Cincinnati to 85.7 at Harrison. The sulfate concentration in micrograms/m^3 of air ranged from 7.4 at Cincinnati to 19.8 in the vicinity of Harrison. The authors conclude that exposure to air polluants measured as sulfates increases the susceptibility and/or duration of some of the common respiratory disorders.

Preventive medicine and epidemiology — field studies in population dynamics and population control. *Gordon, J. E., and J. B. Wyon. p. 361.*

AMERICAN JOURNAL OF THE MEDICAL SCIENCES. *Vol. 240, Oct. 1960.*

◇ **Potential Harmful Effects of Treating Pulmonary Encephalopathy with a Carbon Dioxide Buffering Agent. A. G. Swanson. pp. 433-437.**

Earlier work by other authors on the carbon dioxide buffering drug trishydroxymethylaminomethane (Tris) had indicated that its infusion during severe CO_2 retention in experimental animals served to maintain blood pH and arterial blood pCO_2 at near normal levels. This work suggested its use in patients with pulmonary encephalopathy. In a pilot study the author used this drug on three patients with compensated CO_2 retention. Ventilation and blood gas measurements were carried out on these patients during a control period and during the infusion of Tris. Administration of the drug produced rapid and striking hypoventilation so that a considerable anoxemia developed. The author concluded that the anoxemia produced was potentially harmful and that buffering agents which profoundly alter arterial pCO_2 should be used with considerable caution with patients suffering CO_2 retention.

Behavior of heparanized arterial blood on hemostasis in the dog hind-leg preparation. *Cruz, W. O.; A. C. Oliveira, and M. M. Oliveira. p. 447.*

Dermatology and syphilology — drug eruptions: A review of some of the recent literature. *Kirshbaum, B. A.; H. Beerman, and E. B. Stahl. p. 512.*

ARCHIVES OF NEUROLOGY. *Vol. 3, Sept. 1960.*

Relationship between candidacy and outcome in surgery for Parkinsonism. *Lin, T. H.; G. Dierssen; S. Mingrino, and I. S. Cooper. p. 267.*

Oculomotor function following cerebral hemidecortication in the monkey. *Pasik, P.; T. Pasik, and M. B. Bender. p. 298.*

Motivational and structural factors in the denial of hemiplegia. *Ullman, M.; E. M. Ashenhurst; L. J. Hurwitz, and A. Gruen. p. 306.*

The cerebral circulation. *Wells, C. E. p. 319.*

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ARCHIVES OF NEUROLOGY. *Vol. 3, Oct. 1960.*

◇ **Relation of Peripheral Nerve Fiber Size and Sensation in Man. W. F. Collins, Jr.; F. E. Nulsen, and C. T. Randt. pp. 381-385.**

The exposed sural nerve in 11 pre- and postcordotomy patients was stimulated and monitored on an oscillograph to determine the relationship between the fiber size stimulated and the resultant sensation experienced. The peripheral nerve action potential was divided into four groups by the type wave produced by various intensity and frequency stimulae. The large fibers had the lowest thresholds and fired first so that the groups were recruited in the following order: A-β, A-γ, A-δ, and then the unmyelinated C fiber. No patient experienced a painful or unpleasant sensation from stimulae producing only types A-β or A-γ curves on the oscillograph. When the threshold of the A-δ fibers was reached, usually two to three times the A-γ threshold, all patients described an unpleasant stinging or burning component. If repetitive stimulae were given, the unpleasantness was increased and became too uncomfortable for seven patients to continue repetition. After cordotomy no patient considered repetitive A- firing unpleasant. Upon activation of the C fibers all precordotomy patients found a single stimulus unbearable and refused to continue. After cordotomy this stimulation was well tolerated, but a few noticed an unpleasant sensation when stimulae in the C range were given. It remains a question as to whether the increasing pain was due to the beginning of C fiber firing or to increasing A-δ fiber firing.

◇ **The "Stiff-Man" Syndrome. W. H. Trethowan; J. L. Allsop, and B. Turner. pp. 448-456.**

The authors report two further cases of an obscure neuromuscular disorder first described by Moersch and Woltman and called by them the "stiff-man" syndrome. The patients present muscle spasms which may or may not be painful and of such an intensity as to fracture bones. If localized, the spasms resemble muscle cramps; if generalized, a tetanic spasm lasting from a minute to an hour or more. The spasms may be elicited in a number of ways but cold and emotional stress are the most common. A persistent stiffness develops often mistaken for an upper motor neuron type of rigidity. The trunk and back are most affected; if the limbs are involved the proximal groups are usually most involved. Eventually dysphasia occurs, then inanition and death. Histological examination of the patients presented revealed several changes in the neuromuscular system. The voluntary muscles which were most involved clinically were suggestive of a neural type of muscle atrophy with fasciculi almost entirely composed of small fibers. The less affected muscles had scattered small fibers throughout the fasciculi which appeared like cachexian changes. Clumps of darkly staining nuclei on the muscle fibers appeared most frequently in the area of the neurovascular bundles of the fasciculi and appear to be associated with the terminal arborizations of the vitramuscular vermis. Greenfield suggests that these clumps may represent end-plate nuclei. The pathological basis of this syndrome remains unknown though evidence suggests that it is a type of myopathy arising from some abnormality of the motor end-plates or neuromuscular functions.

Myasthenia gravis in a southern community. *Alter, M.; O. R. Talbert, and L. T. Kurland. p. 399.*

Consideration in loss of sensory level after bilateral cervical cordotomy. *Graf, C. J. p. 410.*

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AMERICAN JOURNAL OF PHYSICAL MEDICINE. *Vol. 39, Aug. 1960.*

◇ **Effects of Short Bouts of Isometric and Isotonic Contractions on Muscular Strength and Endurance. C. E. Walters; C. L. Stewart, and J. F. LeClaire. pp. 131-141.**

This paper investigates the development of strength and endurance through work overload under the following conditions: (1) comparison of gains in strength and endurance when performing against maximal resistance and against two-thirds maximal resistance, (2) comparison of the two isometric methods and isotonic strength development, (3) comparison of the changes in strength and endurance in the contralateral arm from the three methods, (4) isometric measurement of strength achieved by isotonic methods, (5) determination of retention of strength and endurance gained by the three different methods. Fifteen subjects were divided into three groups practising overload lifting 45 seconds a day for eight days. They were retested at the end of three weeks and eight weeks after training. Results based on this study indicate that all methods used are effective in improving strength and retaining it, that the full isometric method is superior to the two-thirds method in strength development, that endurance tends to improve in both the preferred and nonpreferred arm after training, that there is an improvement in strength in the non-preferred (contralateral) arm by all methods of training, and that improvement as measured by one method of testing is not dependent upon the particular method of training employed.

◇ **Analysis of the Temporal Components of Motion in Human Gait. K. U. Smith; C. D. McDermid, and F. E. Shideman. pp. 142-151.**

A new method of measurement of different patterns of human locomotion, the electrobasometer, is applied to detailed analysis of time characteristics of stride and contact movements in walking and running. The mean values of contact and stride time of the feet were measured for 15 subjects ranging from 4½ to 48 years. The r sults of several studies of gait show the contact time of unshod walking at a normal pace to be 0.70 sec., and the stride time to be 0.40 sec. The contact time in men is significantly longer than in women while the stride times are the same. Wearing shoes increases the contact time but not the stride time. Rapid walking decreases contact and stride time but not in a proportionate manner. The stride time in running at a moderate pace is no different than in walking but the duration of sole-contact in walking is significantly longer. The duration of the component movements in normal walking is constant through the age range tested, is unaffected by artificial loading, and is not related to body weight or height. From this study the authors theorize that locomotion represents different patterns of space organized motion rather than a reaction to mechanical factors. Neurally integrated locomotion is related to postural, body transport, and articulated contact movements. This theory of space organized locomotion therefore assumes that functional factors, integrated by the central nervous system, defines the absolute values and relationships of the component movement times in gait.

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BRITISH MEDICAL JOURNAL. *Vol. 2, Aug. 1960.*

◇ **The Fate of the Claudicator. A. Singer, and C. Rob. pp. 633-636.**

This is a follow-up report on the natural history of 322 patients with intermittent claudication observed for an average period of three years. Patients with femoropopliteal thrombosis and with aorto-iliac stenosis and thrombons are considered separately. The first group comprises 219 patients, the second group 103 patients. Diagnosis was based on history and clinical assessment in all and confirmed by arteriography in 205 patients. The results of treatment are analyzed, showing that claudication in a large number of patients remained unchanged or improved on conservative treatment only. Gangrene will still lead to immediate amputation in some patients, although many limbs can be saved by direct arterial surgery or sympathectomy. There were 13 patients with femoropopliteal thrombosis and five with aorto-iliac thrombosis who required amputation for progressive ischemia during the follow-up period. Myocardial ischemia is frequently present in patients with peripheral atherosclerosis. In the present series there were 71 patients who had pre-existing ischemic cardiac disease. Seventy-one episodes of coronary ischemia occurred during the period of observation, 39 of which were fatal and 32 non-fatal. The general mortality of this arteriosclerotic group was high: 41 deaths occurred in the first group, and 33 deaths in the second. The position of long-term anticoagulant therapy is discussed. There were 70 patients on long-term anticoagulant therapy. The figures presented in this survey do not demonstrate any definite improvement in the prognosis for the affected limbs as a result of this treatment.

Aortic occlusion (Leriche's syndrome) in mitral stenosis. *Starer, F., and D. Sutton. p. 644.*

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BRITISH MEDICAL JOURNAL. *Vol. 2, Sept. 1960.*

◇ **Long-term Use of Phenylbutazone in Rheumatoid Arthritis. R. M. Mason, and V. L. Steinberg. pp. 828-830.**

The present study consists of an analysis of 315 patients with rheumatoid arthritis for whom phenylbutazone (butazolidin) was prescribed. These have been followed over a period of at least four years in order to obtain information about the reasons for discontinuing administration of the drug and the types of intolerance observed during specified periods. Reasons for withdrawal of the drug were classified as: 1) intolerance; 2) remission of disease so that continued administration was no longer necessary; 3) drug considered ineffective or inadequate, and 4) miscellaneous causes. In 37.1 per cent the drug was discontinued within three months; in 53.6 per cent within six months, and in 67.6 per cent in the first year. At two years 80 per cent had stopped the drug, and by the end of four years only 12.1 per cent of the original patients were still taking phenylbutazone. The overall intolerance rate was 27.7 per cent, but this accounted for less than one-third (31.4%) of the cases in which the drug was withdrawn. Other important causes were inadequate relief (33.6%) and remission (11.2%). The incidence of intolerance was greatest during the first three months (15.9%). With increasing duration of administration intolerance played a progressively decreasing part in causing withdrawal of phenylbutazone. Gastrointestinal intolerance was the most frequently observed symptom of intolerance, accounting for one-third, but rash (20%), edema, headache and vertigo were all relatively frequent. After more than one year of continuous administration the only toxic effects observed were gastrointestinal although no proved peptic ulcers occurred. Thirty-eight patients (12.1%) continued to take phenylbutazone for over four years with satisfactory control of symptoms and without intolerance.

Hyperuricemia due to pyrazinamide. *Schneeweiss, J., and G. W. Poole. p. 830.*

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BRITISH MEDICAL JOURNAL. *Vol. 2, Oct. 1960.*

◇ **Evolution of Rheumatic Heart Disease in Children. Joint Report by Medical Research Council and American Heart Association. pp. 1033-1039.**

This is a joint report from Great Britain and the United States on rheumatic heart disease in children. It is a sequel to a report published in 1955, and records the subsequent history of the same groups of patients showing a follow-up period of five years. Briefly, the object of the study was to compare the relative merits of ACTH, cortisone and aspirin in the treatment of rheumatic infection and in the prevention of rheumatic heart disease. The current report deals mainly with the second of these questions.

Of the original 497 cases, 445 (89.5%) were known to be alive at the end of the five years, and the status of the heart had been recorded for all but 19 of them. Sixteen (3.2%) patients were known to have died; 14 of them from rheumatic heart disease. Thus 92.7 per cent of 497 cases had been traced at five years. The cases have been divided into three groups according to the status of the heart on admission to the trial — namely, Group A, no or questionable carditis and no pre-existing heart disease; Group B, carditis present but no pre-existing heart disease; and Group C, definite or questionable pre-existing heart disease. One of the most remarkable features of this study is the very low case fatality. No deaths occurred in the 117 Group A cases, four deaths (1.6%) among the 252 Group B cases; and 10 deaths (7.8%) among the 128 Group C cases.

At the end of five years, no evidence was found on the treatment schedule used in this study, that the prognosis has been influenced more by one treatment than another. This confirmed the findings reported at one year. The major factor in determining the incidence of rheumatic heart disease at the end of five years is the cardiac status when treatment was begun. The prognosis for the cases without carditis when treatment was started (Group A) was excellent. None of the patients had died, and 96 per cent of them were without apparent heart disease five years later. In cases with carditis but without pre-existing heart disease (Group B), prognosis was directly dependent on the amount and severity of cardiac involvement at the start of treatment, the proportion with a murmur at five years varying from 18 per cent in those with a grade 1 apical systolic murmur to 70 per cent among those with pericarditis and/or

failure. In cases with pre-existing heart disease the prognosis was poor. Only 30 per cent of those without pericarditis or failure and none of those with pericarditis and/or failure were without heart disease at five years. These results make it clear that in the prevention of rheumatic heart disease no evaluation of therapy of acute rheumatic fever can be valid unless the status of the heart of the patient at the start of treatment is taken closely into account.

◇ **Etiology of Congenital Talipes. W. A. Crabbe. pp. 1060-1063.**

This review was undertaken to ascertain the incidence of other congenital anomalies occurring in association with talipes and to assess the importance of the findings in relation to the etiology of congenital talipes. Of the 172 patients with congenital talipes discussed in this report, 20 had other congenital anomalies of many varieties — an incidence of 11.6 per cent. The high incidence of associated anomalies is thought to indicate a developmental etiology in the production of talipes. If it is accepted that arrested development of the foot could produce the characteristic deformity of clubfoot, a search for the factors which might produce developmental arrest is necessary. Some diseases, such as rubella and mumps, have been incriminated as etiological factors in the production of congenital lesions, while others, such as hyperemesis gravidarum, pulmonary tuberculosis, congestive heart failure, and anemia, have an unknown relationship to the production of congenital lesions. The incidence of maternal disease found in this series (21.4%) suggests that this is a factor of etiological significance. The author feels that surveys conducted throughout pregnancy, rather than in retrospect, would prove helpful in indicating the underlying causative lesion in a high percentage of cases with congenital talipes.

◇ **Treatment of Urinary Infections with Cycloserine. R. W. Fairbrother, and G. Earrett. pp. 1191-1194.**

An increasing number of urinary infections at the present time are being caused by organisms resistant to the usual chemotherapeutic agents. The causative organism is often a Proteus, Ps. pyocyanea, or paracolon which tends to be resistant to the sulphonomides, nitrofurantoin, chloramphenicol and tetrocycline. The introduction of a new effective antibiotic would consequently be an important development. Cycloserine, an antibiotic prepared from Str. orchidaceus and originally used for the treatment of tuberculosis, was tried by the author in 22 cases of urinary infection, 17 of which were complicated by neurological or anatomical disorders. Results were disappointing. Toxic symptoms, such as vertigo and drowsiness, were observed in four out of the 22 patients (18%). Clinical and bacteriological recovery from the urinary infections was produced in only three patients. E. coli was the causative organism of these three infections. Other cases showed only temporary or no improvement; most of these were difficult and complicated cases, caused by resistant strains of Proteus and Pseudomonas. These results, though disappointing, were not unexpected. In vitro tests had indicated quite clearly that in the majority of cases the urinary levels of cycloserine were unlikely to have any appreciable effect, particularly on the difficult Pseudomonas and Proteus strains. The author recommends a strict laboratory control when cycloserine is used for treatment of urinary infection. With such control, the cases likely to respond to treatment can be selected and any unnecessary risk of toxic reactions avoided.

◇ **Serum Enzyme Activity in Muscular Dystrophy. W. H. S. Thomson; P. Leyburn, and J. N. Walton. pp. 1276-1281.**

The estimation of the serum enzymes aldolase, serum glutamic oxalacetic transaminase (S.G.O.T.) and serum glutamic pyruvic transaminase (S.G.P.T.) has become an established procedure in the diagnosis of muscular dystrophy and in the clinical investigation of muscular weakness and atrophy of obscure origin. The object of the present investigation was to compare the activities of these enzymes present in the serum of dystrophic patients of different ages, in an attempt to relate these biochemical findings systematically both to the clinical characteristics of the condition and to its duration in the patient. The cases have been classified on clinical and genetic grounds according to the criteria suggested by Walton and Nattrass. Of a total of 55 patients, 14 were suffering from the Duschenne ("pseudohypertrophic") variety of muscular dystrophy, 15 were cases of facioscapulohumeral type, 14 were of the limb-girdle type and 12 patients were suffering from dystrophia myotonica. In the Duschenne-type dystrophy the serum activity of all three enzymes was elevated at every stage of evolution of the disease, being particularly high in the early stages of the disease and falling steadily as the disease progressed. The activities of serum aldolase, S.G.O.T. and S.G.P.T. obtained in the three other clinical varieties of muscular dystrophy were much less striking than those shown by the cases of Duschenne-type dystrophy. Only moderate and sporatic increases in the serum activities of the enzymes were discovered, and these were always obtained in the early stages of the disease. It is concluded that estimation of these serum enzyme activities, particularly of aldolase, is of considerable value

in the diagnosis of muscular weakness of insidious onset and obscure origin in young children, particularly in boys. Normal findings do not exclude a neurogenic origin but do exclude a diagnosis of Duschenne-type dystrophy, while greatly increased levels in the absence of other florid disease confirm its presence and carry a corresponding grave prognosis. In the other clinical varieties of muscular dystrophy the serum enzyme activities afford little help since normal findings do not exclude the diagnosis. The findings of increased activities of these enzymes in the serum appears to be a secondary result of leakage from diseased muscle cells. There is no evidence that any disorder of function of any of the enzymes referred to is of fundamental importance in the pathogenesis of the disease.

◇ **Dystrophia Myotonica in Childhood. T. M. Vamier. pp. 1284-1288.**

The occurrence of dystrophia myotonica in infants and children is not widely recognized and is occasionally responsible for the presence of congenital facial diplegia and for the syndrome of amyotonica congenita. Six cases are reported of children (3 boys and 3 girls) with dystrophia myotonica whose symptoms dated back to early infancy. The youngest patient was nine months, the oldest 13 years. The clinical features of the disease in childhood are outlined and the use of ancillary aids in diagnosis is mentioned. As in adults, wasting of the temporal, facial, and sternomastoid muscles was an early and characteristic feature. Myotonia was clinically present in the four older children, and a typical electromyographic myotonic pattern was evident in the nine months old patient. None of the cases have been followed up long enough for an accurate assessment of the course of the disease in childhood.

Cerebral fluid gamma-globulin in multiple sclerosis. *Field, E. J., and A. Ridley. p. 1053.*

Neutralization of heparin after perfusion. *Rothnie, N. G., and J. B. Kimmonth. p. 1194.*

Drug prophylaxis in migraine. *Grahame, R. p. 1203.*

Protection of mice against the lethal action of an encephalitis virus. *Hitchcock, G., and A. Isaacs. p. 1268.*

Poliomyelitis epidemic in Mauritius and the effect of vaccination. *Teelock, B. p. 1272.*

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ERGONOMICS. *Vol. 3, April 1960.*

◇ **The Electromyography of Fatigue. O. C. J. Lippold; J. W. T. Redfearn, and J. Vuco. pp. 121-131.**

The authors studied the changes in electrical activity of muscles brought about by voluntary fatigue in two subjects. Records were obtained from muscles using surface electrodes. Conventional concentric needle electrodes were used to obtain localized recordings from muscles. The results showed that as voluntary contraction progresses, the electrical activity from the muscle increases and after several minutes of constant tension the action potentials became closer together and the amplitude of the recording is increased. The form of the individual action potential during and after repetitive activity showed a reduction of the peak to peak amplitude while the duration of the action was lengthened. There was an increase in the degree of synchronization and there was a second type of synchronization which the appearance of large sinusoidal waves with a frequency of 25-30 c/s. As the contraction proceeds the integrated electrical activity increases gradually. When the contraction ceases, the electrical activity falls rapidly to its unfatigued level. An arterial cuff occluding blood flow prevents this recovery, if inflated at the end of the contraction. The authors conclude that as the contractile mechanism weakens, central compensatory events redistribute the activity among synergists. As fatigue progresses, contraction spreads to other neighboring muscles. The authors agree with Merton that neuromuscular block does not occur in voluntary fatigue.

◇ **Changes With Age in the Speed of Performance on a Dial Setting Task. R. J. Simon. pp. 169-174.**

The effects of aging in motor performance were studied by having two widely different age groups adjust two dials one after the other as rapidly as possible until each had been set 12 times. The tasks involved gross manipulation of both dials, fine manipulation of the left and gross manipulation of the right dial, gross manipulation of the left and fine manipulation of the right dial, and fine manipulation of both dials. There was a marked increase with age noted in the time taken to adjust the dials, but a much smaller increase was observed in the time taken to travel between the dials. The author concluded that the greater change with age in the manipulative components of the task lies in the greater perceptual loading associated

with this kind of movement, because the subjects had to decide when a correct setting of the dial had been accomplished before moving to the next setting.

The energy expenditure and mechanical energy demand in walking. *Cotes, J. E., and F. Meade. pp. 97-120.*

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GERIATRICS. *Vol. 15, Oct. 1960.*

◇ **Intra-articular Administration of Triamcinolone Acetonide. L. M. Lockie; B. M. Norcross; D. J. Riordan, and A. F. Riordan. pp. 696-699.**

In a preliminary clinical evaluation, 90 private patients with rheumatoid arthritis and allied arthritic disorders were treated with intra-articular triamcinolone acetonide (Kenalog). A total of 173 joints were injected in varying doses (5-20 mg.) dependent upon joint size. The anti-inflammatory, anti-exudative effects of this corticosteroid were then evaluated clinically, dependent upon the reduction of pain and swelling within the injected joints. Complete or marked relief of pain and swelling were graded as major improvement. Of all joints injected 78 per cent showed major improvement. The duration of effects of a single injection providing major improvement persisted over two weeks in 97 per cent of the cases. There were no untoward reactions to treatment. The response to treatment was deemed most satisfactory. Intra-articular administration of triamcinolone acetonide should be considered an effective adjunct in the treatment of rheumatic diseases, recognizing that its effects are suppressive and not curative.

Problems affecting psychiatric care of the aging. *Busse, E. W. p. 673.*

Otosclerosis surgery for the older patient. *Myers, D.; R. A. Winchester, and W. D. Schlosser. p. 681.*

Geriatric public health practice. *Reynolds, F. W. p. 693.*

Vitamin K and hypoprothrombinemia of liver disease. *Steigmann, F., and K. Cohen. p. 700.*

Social gerontology. *Tibbitts, C. p. 705.*

Clinicopathologic conference — Minneapolis veterans hospital. *Watson, C. J.; H. H. Zinneman, and P. F. Bowlin. p. 718.*

Report on the international gerontological congress. *p. 726.*

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JOURNAL OF APPLIED PHYSIOLOGY. *Vol. 15, July 1960.*

◇ **Respiratory Responses of Underwater Swimmers to Oxygen. Leon J. Greenbaum, Jr. pp. 575-578.**

The respiratory effects of oxygen at atmospheric pressure in laboratory personnel and trained underwater swimmers were studied with the subjects resting in the supine position. The breathing of oxygen for 10 minutes by both groups was associated with significant depression of respiratory rate and inspiratory minute volume and no significant alteration in end-tidal carbon dioxide tension. Associated with the fall in rate was a significant increase in tidal volume, but this increase was not great enough to prevent a significant depression of ventilation. The oxygen consumption of the swimmers was significantly greater than that of the laboratory personnel. The swimmers had lower oxygen ventilatory equivalents suggesting that they respired more efficiently than the laboratory personnel.

◇ **Proteinuria During the 24-Hour Period Following Exercise. R. D. Coye, and R. R. Rosandich. pp. 592-594.**

This report deals with the clearance of serum proteins by the kidney in the 24-hour period following exercise. The urine of 10 football players was collected four days before, 30 minutes after and for 24 hours following a football game. A venous blood sample was obtained five hours after the game. Urine and blood were also collected two weeks later. Post-exercise urine of nine players contained granular casts, while eight contained red blood cells and seven showed protein present. The 24-hour specimen of urine contained 2.3-15.2 times as much protein as urine collected during a period of rest. No changes were noted on electrophoresis of the serum proteins. The renal clearance of serum albumin increased more than the clearance of serum

globulins following exercise, but in both the control and post-exercise specimens the clearance of globulins and percentage of globulins in the urine usually exceeded these values for albumin. Considerable variation in the excretion of proteins was noted among individual subjects in the control period; as protein excretion patterns became more uniform in these subjects. Compared to previously described exercise proteinuria which occurs immediately following exercise, this second phase is characterized by less intense protein excretion and longer duration. The authors conclude that there are two phases of protein excretion. An initial phase of heavy proteinuria related to increased permeability of the glomerulus, and a second phase in which less protein is excreted. The latter phase might result from either delayed repair of a glomerular defect or from impaired tubular reabsorption of the filtered protein following the renal ischemia.

Lung volumes, lung compliance and airway resistance during negative pressure breathing. *Ting, E. Y.; S. K. Hong, and H. Rahn. p. 554.*

Response to ventilatory obstruction during steady state exercise. *Tabakin, B. S., and J. S Hanson. p. 579.*

Physical fitness of Arctic Indians. *Anderson, K. L.; A. Bolstad; Y. Loyning, and L. Irving. p. 645.*

Electrodiagnosis of vitamin E-deficient and denervated skeletal muscle of rabbits. *Fudema, J. J.; Y. T. Oester; J. A. Fizzell, and A. J. Gatz. p. 671.*

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JOURNAL OF PEDIATRICS. *Vol. 57, Oct. 1960.*

◇ **A Syndrome of Phenylketonuria With Normal Intelligence and Behavior Disturbances. B. S. Sutherland; H. K. Berry, and H. C. Shirkey. pp. 521-525.**

This disease, usually described as mental retardation associated with phenylketonuria, has been the subject of numerous papers during the past 20 years. During the past five years diets low in phenylalanine have become available, and as a result it now appears possible to prevent the rapid progressive central nervous degeneration which occurs in untreated infants with high phenylalanine levels in the serum. More careful testing has revealed a number of children with phenylketonuria, however, with normal or near normal intelligence. This article is of importance to physicians working in the field of rehabilitation because such areas are likely to come to a rehabilitation center for therapy. Recognition of the disorder is important both in the management of the patient and in preventing damage to any subsequent children born into the family.

◇ **Infantile Autism. An Analysis of 50 Cases and a Consideration of Certain Relevant Neurophysiologic Concepts. R. J. Schain, and H. Yannet. pp. 560-567.**

This is an excellent review of previous concepts of the puzzling syndrome of extreme withdrawal from contact with people or failure to develop such relationships which occurs in infants and very young children who do not have obvious motor retardation or gross neurological damage. It is of more than passing interest to the physician interested in rehabilitation that children with severe sensory defects such as blindness or deafness or known brain damage show similar disabilities. In this series of 50 cases, 42 per cent of the children had seizures at some time in their lives. Five of 11 children had electroencephalograms, obtained during periods of seizure activity, which revealed diffusely abnormal tracings. As a result, the authors emphasize the importance of looking for abnormalities of the central nervous system in evaluating the pathogenesis of the syndrome. In conclusion, the authors raise the possibility that the limbic system (roughly equivalent to the rhinencephalon) is the site of abnormality responsible for the seizures and disorder of affect.

Early motor development. *Holt, K. S. p. 571.*

Polyneuronitis: Guillain-Barre syndrome. *Blattner, R. J. p. 625.*

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JOURNAL OF PEDIATRICS. *Vol. 57, Nov. 1960.*

◇ **Waardenburg's Syndrome. A. M. DiGeorge; R. W. Olmsted, and R. D. Harley. pp. 649-669.**

The authors present a group of deaf patients, including several Negroes, demonstrating the findings in this hereditary disorder not previously reported in America. Waardenburg's syn-

drome will be of interest to physicians dealing with rehabilitation because one of the major characteristics is deaf mutism. The other major components, in order of decreasing frequency, according to this report, are lateral displacement of the medial canthi and lacrimal points, broad prominent root of the nose, hyperplasia of the medial portions of the eyebrows, heterochromia of the iris, and white forelock. There may be other associated pigment disorders. The cause of deafness in one previously reported post mortem study was absence of the organ of Corti and atrophy of the spiral ganglion.

Urinary tract calculi and nephrocalcinosis in infants and children. *Daeschner, C. W.; E. B. Singleton, and J. C. Curtis. p. 721.*

A case of measles encephalitis complicated by Alcaligenes faecalis septicemia. *Mengedoht, M. M.; J. K. Aton, and A. Berry. p. 738.*

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NEUROLOGY. Vol. 10, June 1960.

◇ **Cerebrovascular Disease: IV. A Study of a Norwegian Population. A. B. Baker; S. Refsum, and E. Dahl. pp. 525-529.**

Atherosclerotic changes of the large arteries of the circle of Willis were studied in 579 consecutive autopsies in a Norwegian population. The changes were graded according to the coding system published by the World Federation of Neurology. Atherosclerosis first appeared at the end of the third decade of life but did not become prominent until the early part of the fifth decade. Nine per cent of individuals over 90 years of age had no changes. Both sexes were equally involved. The most frequently involved areas were the internal carotid arteries; both anterior to and at the trifurcation; the first part of the middle cerebral and posterior cerebral arteries; and the upper and lower parts of the basilar artery. The vertebral arteries and the midportion of the basilar artery were next in intensity and frequency of atherosclerotic change.

◇ **Mechanical and Electrical Responses of Intact Thenar Muscles to Indirect Stimuli. Stella Y. Botelho; Sibyl B. Beckett, and Eleanor Bendler. pp. 601-612.**

Simultaneous recording of isometric tension and action potential of intact thenar muscle as produced by ulnar nerve stimulation in normal subjects and in patients with pseudo-hypertrophic muscular dystrophy were made. Developed tension in patients with dystrophy was 16 and 25 per cent less than in normal subjects of the same age. Area under action potential curves and maximum amplitudes were about 30 per cent of normal. Both area and tension differences appeared early in the disease when clinically the distal musculature did not appear to be involved. The slope of active and passive length tension curves indicated that the contractile and/or noncontractile tissue in dystrophic patients were less stiff, and that this change in extensibility was different than that seen in denervated and immobilized muscle. Refractory periods were the same in muscle of normal subjects and of dystrophic patients. The difference in stiffness characteristics and in tetanic events in human pseudo-hypertrophic dystrophic muscle and in mouse genetic dystrophic muscle indicated that the two disease processes are not similar.

Effect of acetazoleamide (Diamox) on encephalopathy. *Swanson, August G. p. 537.*

The tentorial nerves and localization of intracranial pain in man. *Feindel, William; Wilder Penfield, and Francis McNaughton. p. 555.*

Microelectrode studies of unit discharges in the sensorimotor Cortex. *Cordeau, J. Pierre; Jan Gybels; Herbert Jasper, and Louis J. Poirier. p. 591.*

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NEUROLOGY. Vol. 10, July 1960.

Simultaneous determinations of retinal and carotid artery pressures. *Tindall, George T.; Herbert T. Dukes; Horace B. Cupp, Jr., and Noble J. David. p. 623*

Case report: **Hereditary sensory radicular neuropathy.** *Mandell, A. J., and C. K. Smith. p. 627.*

Differentiation of tumors arising in area of the posterior third ventricle. *Tytus, John S. p. 654.*

Guillain-Barre syndrome resulting from tetanus antitoxin injection. *Miglets, Andrew W.; William G. Bartlett; Carl A. Arbesman, and William D. Loeser. p. 658.*

Neurologic status of 3-year-old children originally studied at birth. *Thurston, Don; Frances K. Graham; Claire B. Ernhart; Peter L. Eichman, and Marguerite Craft. p. 680.*

Progressive ataxia in childhood with particular reference to ataxia-telangiectasia. *Sedgwick, Robert P., and Elena Boder. p. 705.*

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NEW ENGLAND JOURNAL OF MEDICINE. *Vol. 263 (Aug. 4) 1960.*

◇ **Plastic Surgery: The Hand (Concluded). B. Cannon, and E. Peacock. pp. 238-242.**

The most disabling trauma to the hand is often the crushing injury with avulsion or destruction of skin, tearing of tendons and nerves and multiple fractures of the long structures. Early debridement of devitalized tissue, temporary coverage with skin graft, followed by definitive flap resurfacing when indicated, careful splinting, early mobilization and late replacement of missing tendons and bone is of importance in the treatment. A major loss of hand function is sustained when the thumb is amputated. Reconstruction by a pedicle flap into which a long strut is inserted provides a post against which the finger can oppose, but the post is without sensation and the mobility limited or absent. An adjacent digit can be transferred to the thumb. The major tendons of the thumb are attached to the intact tendons of the finger, and when the thumb muscles begin to function in flexing and extending the transposed finger, the digit becomes identified as a thumb.

Injury to the median nerve, injury to the muscles or local cicatricial contracture can result in loss of opposition. Opposition can be restored by substitution of muscles of the forearm that have tendons extending to the wrist or hand. Several methods are described. Hydrocortisone can be useful in a variety of conditions associated with troublesome inflammation or fibrosis in the hand. Nonspecific tenosynovitis appears to head the list of those effectively treated by the injection of hydrocortisone. Normal function after the repair of injured hands presents many complex problems. Among the unsolved problems are the joint stiffness and tendon adhesion due to abnormal collagen formation.

The problems of collagen production, collagen alteration and collagen destruction and reabsorption are shortly discussed but need further investigations. Immobilization seems to stimulate new collagen formation. The process is not understood.

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NEW ENGLAND JOURNAL OF MEDICINE. *Vol. 263 (Aug. 18) 1960.*

◇ **Knee Pain Due to Saphenous-Nerve Entrapment. H. P. Kopell, and W. A. L. Thompson. pp. 351-353.**

Pain in the knee can arise either from intrinsic or from extrinsic sources. A pathologic process in or near the hip joint can give rise to knee pain. It is believed that impulses from the obturator-nerve stimulation cause an overflow in the internuncial pool, giving rise to sensation derived from more distal portions of the obturator distribution. Foot strain is often implicated as a source of knee pain. A mechanical irritation of the saphenous nerve is often the source of knee pain. After its derivation from the femoral nerve, the saphenous nerve travels in the subsartorial canal in proximity to the femoral vessels. About 10 cm. above the medial femoral epicondyle the nerve pierces the subsartorial fascia on its way to its final innervation. The point of emergence through the subsartorial fascia is its region of mechanical vulnerability. Irritation here will cause pain in the knee and down the medial aspect of the leg. The nerve trunk distal to this point is usually tender. Two cases of entrapment neuropathy of the saphenous nerve are recorded. The chief diagnostic problem was the differentiation of this entity from an inflammation of the medial collateral ligament, or an occult meniscal injury. The final diagnosis was suggested by nerve tenderness at its point of exit from the subsartorial canal, the sensory disturbance in its area of innervation and the response to nerve block with hydrocortisone. Although surgical intervention was necessitated by the persistent symptomatology this is not advocated as the sole method of treatment.

Treatment of fractures and dislocations, 1950-1960. *Quigley, T. B., and H. Banks p. 344.*

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NEW ENGLAND JOURNAL OF MEDICINE. *Vol. 263 (Aug. 25) 1960.*

Treatment of fractures and dislocations, 1950-1960. *Quigley, T. B., and H. Banks. p. 391.*

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NEW ENGLAND JOURNAL OF MEDICINE. *Vol. 263 (Sept. 1) 1960.*

◇ **Neurosurgical Alleviation of Intention Tremor of Multiple Sclerosis and Cerebellar Disease. Irving Cooper. pp. 441-444.**

Pure intention tremor of severe and incapacitating magnitude can be relieved by interruption of the cerebellothalamocortical pathway by means of a lesion placed in the region of the ventrolateral nucleus of the thalamus by the technic of chemothalamectomy. It is the purpose of this report to summarize an investigation into the effects of thalamic surgery on incapacitation intention tremor. Twelve patients with severe, incapacitating intention tremor were studied. The causes of intention tremor in these cases were as follows: severe brain trauma, two cases; multiple sclerosis, six cases; familial cerebellar degeneration, two cases; severe cerebellar degeneration, two cases; severe cerebellar degeneration of unknown origin, one case; and olivopontocerebellar degeneration, one case. The ages of the patients operated upon vary from 20 to 68 years, and the duration of incapacitating cerebellar tremor from three to more than 30 years. In 10 of the cases practically complete relief of the tremor was obtained by chemothalamectomy. In one case a preexistent spastic hemiparesis due to multiple sclerosis was aggravated by surgery. There were no adverse effects in the other cases. In five of the patients there was marked spontaneous nystagmus before operation. In three of these notable diminution of the nystagmus followed operation. In seven cases there appeared to be a signficant improvement in intention tremor of the extremities ipsilateral to the side of operation, in addition to the virtually complete relief of intention tremor on the side contralateral to operation. Seven patients demonstrated constant tremor of the head. In five of these marked improvement in head tremor was observed after operation.

Treatment of fractures and dislocations, 1950-1960. *Banks, H., and T. B. Quigley. p. 444.*

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NEW ENGLAND JOURNAL OF MEDICINE. *Vol. 263 (Sept. 8) 1960.*

Progress in the treatment of fractures and dislocations, 1950-1960. *Quigley, T. B., and H. Banks. p. 493.*

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NEW ENGLAND JOURNAL OF MEDICINE. *Vol. 263 (Sept. 15) 1960.*

◇ **Prevention and Treatment of Respiratory Complications in Surgery. Benson B. Roe. pp. 547-550.**

Respiratory complications play a significant part in postoperative morbidity and mortality. The reported incidence of these complications ranges from 1.2 per cent to 43.5 per cent. Obstruction of major or minor bronchi is probably the cause of nearly all respiratory complications. Attention should be paid primarily to the prevention and treatment of atelectasis. Atelectasis should be assumed to be present in any patient whose chart shows even a small increase in temperature, pulse and respiratory rate in the early postoperative period. Premedication, muscle relaxants, intratracheal intubation, deep and prolonged anesthesia, narcotics, pain, and binders or dressings are all factors predisposing to pulmonary complications. Preoperative instruction has proved to be of great value, particularly in elderly or chronically ill patients. Many patients are unfamiliar with technics for effecting optimal ventilation and effective coughing. These technics should be taught by properly trained physical therapists. The operative care is of importance. Anesthesia must be conducted smoothly and precisely to avoid airway and profound central-nervous-system depression. Continued ventilatory assistance is necessary until the patient is completely awake and coughing is necessary. Position during the operation should be planned with at least as much consideration for the patient's ventilatory function as for the surgeon's technical comfort. Postoperatively the patient should be placed head down until he is completely awake to diminish aspiration of vomitus or oral contents. Deep breathing and coughing should be encouraged as soon as the patient is awake and should be repeated at frequent intervals. Early ambulation is of great value in preventing respiratory complications. Muscular action and tissue mobilization in the operative site will reduce later pain and prevent ventilatory restriction. Hydration and expectorants are helpful in mobilizing bronchial secretions. Proteolytic enzymes and wetting agents have been used with benefit. Aspiration of secretions for the tracheobronchial tree is frequently necessary to maintain a clear airway. Tracheostomy is recommended when the least doubt exists about the patient's ability to maintain an airway with the aid of measures already described. Mechanical assistance to aid an inadequate res-

piratory excursion is often of value. Posture may play a significant part in the development of pulmonary complications.

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NEW ENGLAND JOURNAL OF MEDICINE. *Vol. 263 (Sept. 29) 1960.*

Sydenham's chorea without evidence of rheumatic fever: Report of its association with the Henoch-Schonlein syndrome, and with systemic lupus erythematosus, and review of the literature. *Paradise, J. L. p. 625.*

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NEW ENGLAND JOURNAL OF MEDICINE. *Vol. 263 (Oct. 6) 1960.*

◇ **Avascular Necrosis of the Femoral and Humeral Heads after High-Dosage Corticosteroid Therapy. W. Heimann, and R. Freiberger. pp. 672-675.**

Osteoporosis and resulting vertebral fractures are almost the only skeletal changes caused by long term corticosteroid therapy. In this paper four cases of avascular necrosis of the femoral and humeral heads after high-dosage corticosteroid therapy are presented. The patients received therapy for erythema multiforme bullosum, pemphigus, multiple sclerosis and thrombotic thrombocytopenic purpura. The most commonly used medication was cortisone. Three of the patients also received varying doses of ACTH. The primary clinical manifestation of avascular necrosis is pain, which appeared approximately three to 12 months after the initiation of corticosteroid therapy. Disability varied from practically total incapacitation to moderate restriction of walking. None of the patients had any evidence of Gaucher's disease or other systemic diseases in which avascular necrosis of bone may be found. Avascular necrosis of the femoral head of unknown cause occasionally occurs. The possibility that all these cases represent an idiopathic avascular necrosis seems unlikely, and since the common feature in all the cases is treatment with unusually large doses of systemically administered corticosteroids, it is believed that this may be a newly recognized serious complication of such therapy.

◇ **The Relation between the Antinuclear, Rheumatoid and L. E. Cell Factors in the Systemic Rheumatic Diseases. A. P. Hall; W. A. Bardawil; T. B. Bayles; A. D. Mendis, and N. Galins. pp. 769-775.**

In this paper a considerable number of patients with systemic rheumatic diseases whose syndromes were, by clinical and pathological criteria, sharply defined, are examined with the graded, three step latex fixation test, L. E. cell preparations and the fluorescent-antibody test for antinuclear globulin. Of 22 patients with disseminated lupus erythematosus all had positive tests for antinuclear globulin, and, by selection, positive L. E. cell preparations. Latex tests were not positive in the serum step in any case, and in only two did the euglobulin fraction agglutinate sensitized latex particles. Of the 130 patients with rheumatoid arthritis 98 per cent showed rheumatoid factor, 13 per cent L. E. cell factor, and 36 per cent antinuclear globulin. The patients with scleroderma, four patients with polyarteritis nodosa and 3 patients with dermatomyositis usually showed antinuclear activity when the disease was active, but rheumatoid and L. E. cell factors were usually not demonstrated. Ten patients with rheumatoid arthritis showed all three factors. In these patients it was possible to separate the rheumatoid factor from the other two by absorption technics. It was not possible to separate the antinuclear and L. E. cell factors from each other by absorption. The findings in the experiments suggest that although there are general patterns of serologic tests that are typical for each syndrome, the factors may be found singly or in combination in patients with each of the systemic rheumatic diseases. The results showed, moreover, that in rheumatoid patients in whom all three tests were positive rheumatoid factor was different and separable from the factors that produces L. E. cells and nuclear binding; in such cases none of the tests could be considered to be falsely positive.

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The Survey of Selected Literature for February 1961 was prepared by

Else A. Tophoj, M.D. *Odense, Denmark*	*for*	Acta Physiologica Scandinavica New England Journal of Medicine
Richard W. Stow, Ph.D. *Tehran, Iran*	*for*	American Journal of the Medical Sciences
John D. Guyton, M.D. *Worthington, Ohio*	*for*	Archives of Neurology
Herbert A. Schoening, M.D. *Minneapolis*	*for*	American Journal of Physical Medicine Ergonomics Journal of Applied Physiology
Osvaldo Miglietta, M.D. *Astoria, N. Y.*	*for*	British Medical Journal
Robert M. Wells, M.D. *Columbus, Ohio*	*for*	Geriatrics
Harold M. Sterling, M.D. *Brighton, Mass.*	*for*	Journal of Pediatrics
Walter C. Stolov, M.D. *Seattle*	*for*	Neurology

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